

**CH2MHILL**

14 September 2006

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SUBJECT: AFCEE 4P F41624-03-D-8595; Task Order 0384  
MMR SPEIM/LTM/O&M Program  
CDRL #A001H  
**Final Fuel Spill-28 2005 Plume Update Technical Memorandum**

Dear Mr. Davis:

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Sincerely,

CH2M HILL

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# Massachusetts Military Reservation



## ***Final Fuel Spill-28 2005 Plume Update Technical Memorandum***

**September 2006**

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## TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS .....	iv
1.0 INTRODUCTION .....	1-1
1.1 BACKGROUND .....	1-1
1.2 REPORT ORGANIZATION .....	1-3
2.0 DATA COLLECTION ACTIVITIES .....	2-1
2.1 CONVENTIONAL DRILLING .....	2-1
2.2 DIRECT PUSH DRILLING .....	2-2
2.3 PUSH-POINT SAMPLING .....	2-3
2.4 HYDRAULIC MONITORING .....	2-3
2.5 GROUNDWATER CHEMICAL MONITORING .....	2-4
2.6 SURFACE WATER CHEMICAL MONITORING .....	2-4
3.0 RESULTS AND ANALYSIS .....	3-1
3.1 HYDROGEOLOGY .....	3-1
3.1.1 Lithologic Descriptions .....	3-2
3.1.2 Estimates of Hydraulic Conductivity .....	3-4
3.1.3 Hydraulic Data .....	3-5
3.1.3.1 SPEIM Synoptic Event .....	3-5
3.1.3.2 Supplemental Synoptic Events .....	3-6
3.1.4 Average Linear Velocities .....	3-9
3.2 CHEMISTRY DATA .....	3-10
3.2.1 Groundwater .....	3-10
3.2.1.1 Upgradient and in the Vicinity of the Treatment System .....	3-10
3.2.1.2 Downgradient of the Treatment System .....	3-17
3.2.1.3 Plume Shell .....	3-20
3.2.2 Surface Water .....	3-22
4.0 CONCEPTUAL SITE MODEL UPDATE .....	4-1
4.1 PREVIOUS CONCEPTUAL SITE MODEL .....	4-1
4.2 REVISED CONCEPTUAL SITE MODEL .....	4-2
4.3 ASSESSMENT OF PRIVATE WELLS IN THE STUDY AREA .....	4-3
5.0 CONCLUSIONS AND RECOMMENDATIONS .....	5-1
5.1 CONCLUSIONS .....	5-1
5.2 UNCERTAINTIES .....	5-2

## TABLE OF CONTENTS

5.3 RECOMMENDATIONS.....	5-3
5.3.1 Leading Edge Investigation.....	5-3
5.3.2 Hydraulic Monitoring.....	5-4
5.3.3 Chemical Monitoring.....	5-4
5.3.4 Residential Well Sampling.....	5-6
6.0 REFERENCES .....	6-1

### **Figures**

<a href="#"><u>Figure 1-1</u></a>	FS-28 Plume and Treatment System
<a href="#"><u>Figure 2-1</u></a>	FS-28 Drilling Locations
<a href="#"><u>Figure 2-2</u></a>	FS-28 Groundwater Hydraulic Monitoring Locations
<a href="#"><u>Figure 2-3</u></a>	FS-28 Chemical Monitoring Locations
<a href="#"><u>Figure 3-1</u></a>	Groundwater Contours North of FS-28 ETD System
<a href="#"><u>Figure 3-2</u></a>	Precipitation Between March 2004 and March 2005
<a href="#"><u>Figure 3-3</u></a>	FS-28 Shallow Groundwater Contour Map – November 2005
<a href="#"><u>Figure 3-4</u></a>	FS-28 Deep Groundwater Contour Map – November 2005
<a href="#"><u>Figure 3-5</u></a>	FS-28 Shallow Groundwater Contour Map – March 2006
<a href="#"><u>Figure 3-6</u></a>	FS-28 Deep Groundwater Contour Map – March 2006
<a href="#"><u>Figure 3-7</u></a>	FS-28 EDB Plume and Location of Cross-Section Lines
<a href="#"><u>Figure 3-8</u></a>	FS-28 Cross-Section A-aa'
<a href="#"><u>Figure 3-9</u></a>	FS-28 Cross-Section aa-A'
<a href="#"><u>Figure 3-10</u></a>	FS-28 Cross-Section B-B'
<a href="#"><u>Figure 3-11</u></a>	FS-28 Cross-Section C-C'
<a href="#"><u>Figure 3-12</u></a>	FS-28 Cross-Section D-D'
<a href="#"><u>Figure 3-13</u></a>	FS-28 2001, 2003 and 2006 EDB Plume Shells
<a href="#"><u>Figure 3-14</u></a>	2006 Plume Shell with Capture Zones for 69EW0001 and SWP System Under Current Design Rates
<a href="#"><u>Figure 5-1</u></a>	Proposed FS-28 Drilling Locations
<a href="#"><u>Figure 5-2</u></a>	Proposed FS-28 Groundwater Chemical Monitoring Network
<a href="#"><u>Figure 5-3</u></a>	Proposed FS-28 Surface Water Chemical Monitoring Network

## TABLE OF CONTENTS

### **Tables**

<a href="#"><u>Table 2-1</u></a>	FS-28 Well Construction and Surface Water Sampling Location Information
<a href="#"><u>Table 3-1</u></a>	Hydraulic Monitoring Results
<a href="#"><u>Table 3-2</u></a>	Measured Vertical Hydraulic Gradients in the Uncaptured Portion of the FS-28 Plume
<a href="#"><u>Table 3-3</u></a>	Groundwater EDB Monitoring Results and Water Quality Parameters
<a href="#"><u>Table 3-4</u></a>	Surface Water EDB Monitoring Results and Water Quality Parameters
<a href="#"><u>Table 5-1</u></a>	Proposed Groundwater Chemical Monitoring Network
<a href="#"><u>Table 5-2</u></a>	Proposed Surface Water Chemical Monitoring Network

### **Appendices**

<a href="#"><u>Appendix A</u></a>	Boring Logs
<a href="#"><u>Appendix B</u></a>	Well Construction Diagrams
<a href="#"><u>Appendix C</u></a>	Grain Size Analysis
<a href="#"><u>Appendix D</u></a>	Plume Shell Development
<a href="#"><u>Appendix E</u></a>	Vertical Profile Groundwater Data



## ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
BRL	below the reporting limit
CSM	conceptual site model
CWSW	Coonamessett Water Supply Well
EDB	ethylene dibromide
ETD	extraction, treatment, and surface water discharge
FS-28	Fuel Spill-28
ft <sup>3</sup>	cubic feet
ft bgs	feet below ground surface
ft/day	feet per day
ft msl	feet mean sea level
gpm	gallons per minute
lbs	pounds
MMCL	Massachusetts Maximum Contaminant Level
MMR	Massachusetts Military Reservationm
SPEIM	system performance and ecological impact monitoring
SWP	shallow wellpoint
µg/L	micrograms per liter

## **1.0 INTRODUCTION**

This technical memorandum presents a plume update for the Fuel Spill-28 (FS-28) plume ([Figure 1-1](#)). The plume update is based on data collected between 01 April 2004 through 31 March 2006 under the System Performance and Ecological Impact Monitoring (SPEIM) program. As part of the plume update new data were collected to characterize the uncaptured portion of the plume and the upper boundary of the plume immediately upgradient (i.e., north) of the FS-28 deep extraction well (69EW0001). The data collected during the characterization efforts (e.g., drilling and groundwater sampling) along with the data collected during the routine SPEIM sampling events were used to develop a new plume shell and update the conceptual site model, with a focus on the uncaptured portion (leading edge) of the plume.

This technical memorandum presents data collected through March 2006, however, investigation activities are ongoing (as of May 2006) to better define the hydrogeology in the leading edge area. The ongoing data collection activities are primarily associated with gathering additional hydraulic monitoring data south of the mapped extent of the plume. The extent of the plume has been adequately characterized based on the data presented in this technical memorandum. The data collected during the ongoing investigation will be presented when available to the regulators during technical update meetings.

This investigation was conducted in support of the Air Force Center for Environmental Excellence (AFCEE) Installation Restoration Program at the Massachusetts Military Reservation (MMR) under AFCEE's 4P Contract Number F41624-03-D-8595, Task Orders 0164, 0251, and 0384.

### **1.1 BACKGROUND**

The FS-28 plume is detached from an unknown source area located on the MMR. The FS-28 plume is located south of the MMR in the Town of Falmouth, and extends from immediately north of Boxberry Hill Road to just north of the intersection of Sandwich and Turner Roads ([Figure 1-1](#)). The contaminant of concern within the plume is ethylene

dibromide (EDB). The FS-28 plume is defined as the extent of groundwater contaminated with EDB at concentrations exceeding the Massachusetts Maximum Contaminant Level (MMCL) of 0.02 micrograms per liter ( $\mu\text{g/L}$ ).

Remediation of the FS-28 plume began in October 1997 with the startup of the deep extraction well (69EW0001). In April 1999, the remedial system was expanded with the startup of the shallow wellpoint (SWP) extraction system. The SWP extraction system was installed to intercept shallow EDB contaminated groundwater before it discharged to the Coonamessett River or associated cranberry bogs. The deep extraction well is currently operating at a design flow rate of 550 gallons per minute (gpm) and the SWP system at 200 gpm. The FS-28 extraction, treatment, and surface water discharge (ETD) system removes EDB from the extracted groundwater using granular activated carbon, and discharges the treated effluent to the Coonamessett River via two bubblers.

A portion of the plume is located to the south (i.e., hydraulically downgradient) of the capture zones of the FS-28 remedial system. This leading edge (or uncaptured) portion of the plume was not intended to be captured by the current treatment system (AFCEE 2000). According to early conceptual site models, the relatively low contaminant mass contained in the uncaptured portion of the plume (compared to the main FS-28 plume to the north) would rise in the aquifer and ultimately discharge to the Coonamessett River and associated cranberry bogs (AFCEE 1998b).

Based on 2004 groundwater vertical profiling sample results, the uncaptured portion of the plume, south of Thomas B. Landers Road, contains higher EDB concentrations and is thicker (vertically) than was previously understood. These results led to recommendations in the *Final FS-28 2004 System Performance and Ecological Impact Monitoring Report* to characterize the uncaptured portion of the plume (AFCEE 2004a). The final FS-28 2004 SPEIM report also recommended the characterization of the upper boundary of the plume upgradient (i.e., north) of the deep extraction well ([Figure 1-1](#)) using direct push drilling because this boundary could not be well defined based on the data collected at the available well screens.



## 1.2 REPORT ORGANIZATION

This report consists of six sections and five appendices. The data collection activities included in this technical memorandum are summarized in Section 2. The results of the drilling and monitoring activities and their interpretation are presented in Section 3. An updated conceptual site model is presented in Section 4. Conclusions and recommendations are presented in Section 5 and references are listed in Section 6.

The boring logs for sonic drilling locations are included in [Appendix A](#). [Appendix B](#) contains well construction diagrams. Results of grain size analyses for soils collected at the sonic drilling locations are included in [Appendix C](#). The FS-28 plume shell development is presented in [Appendix D](#). Groundwater vertical profile data collected during drilling activities are included in [Appendix E](#).

## 2.0 DATA COLLECTION ACTIVITIES

The characterization and monitoring data collected to meet the objectives of this plume update included: (1) chemical data from groundwater vertical profiling and lithologic information from the collection of soils samples and/or interpretation of purge water during drilling activities (both conventional and direct push drilling); (2) shallow groundwater quality data collected using a push-point sampler; and (3) groundwater and surface water monitoring data collected through the SPEIM program. Drilling (both conventional and direct push) and push-point sample locations are presented on [Figure 2-1](#). All groundwater and surface water samples were analyzed for EDB using U.S. Environmental Protection Agency method E504.1 at the MMR on-site laboratory. In addition, water quality parameters (temperature, dissolved oxygen, pH, oxidation-reduction potential, specific conductance, and turbidity) were also measured in the field at each groundwater or surface water sample location, or groundwater sampling interval. Hydraulic monitoring locations are depicted on [Figure 2-2](#). Groundwater and surface water chemical monitoring locations are shown on [Figure 2-3](#). Well construction and surface water location information is provided in [Table 2-1](#). The results of these activities and an evaluation of the data are presented in Section 3.0.

### 2.1 CONVENTIONAL DRILLING

Groundwater vertical profiling and lithologic logging were conducted at three borings advanced to bedrock using the sonic drilling technique (69MW0012A, 69PZ0004A, and 69BH2001). A fourth sonic soil boring (69BH2000) was advanced to approximately 75 feet below ground surface (ft bgs) for geologic characterization of the shallow portion of the aquifer adjacent to the East Thompson bog ([Figure 2-1](#)).

Borehole groundwater screening samples were collected at 10-foot intervals from the water table to the base of the overburden at the three borings that were advanced to bedrock. Groundwater samples were not collected from the fourth shallow sonic boring (69BH2000) because groundwater quality had been assessed at two nearby direct push locations (69DP0120 and 69DP0122). Soil samples were collected from each sonic boring for lithologic classification and grain size analysis. Grain size analysis data were

used to verify the field geologist's interpretation and characterization of soil cores. Soil boring logs for these drilling locations are presented in [Appendix A](#). Monitoring wells and/or piezometers were installed at two locations (69MW0012A and 69PZ0004A). Well construction diagrams are presented in [Appendix B](#).

Each boring, well, or piezometer installed during the conventional drilling program were surveyed for horizontal and vertical position in the Massachusetts State Plane Coordinate System North American Datum of 1927 and National Geodetic Vertical Datum of 1929.

## **2.2 DIRECT PUSH DRILLING**

Groundwater vertical profiling was conducted at 32 locations using direct push drilling technology. Five borings were located within the northern portion of the plume, north of deep extraction well 69EW0001, two borings were located within the shallow plume between 69MW1317 and the SWPs, and 25 borings were advanced to characterize the uncaptured portion of the plume south of the SWPs ([Figure 2-1](#)). Groundwater vertical profile samples were collected at 10-foot intervals from the water table to refusal. Soil samples could not be collected during groundwater vertical profile sampling with the direct push rig, however, changes in lithology were inferred from the rate of advancement of the drilling rods, and from field observations of purge water turbidity, color and flow rates at each sample interval.

Of the 25 direct push borings advanced in the vicinity of the uncaptured portion of the plume, seven locations were completed with a deep and shallow groundwater piezometer couplet. Only one shallow piezometer screen (69PZ0006B) was installed at direct push drilling location 69DP1006 on the western side of Round Pond ([Figure 2-1](#)). Direct push drilling was also used to install monitoring wells 69MW1306C (on the western edge of the West Thompson Bog) and 69MW1317C (on the eastern side of the Upper Baptiste Bog) ([Figure 2-1](#)). Construction diagrams for these piezometers and monitoring wells are presented in [Appendix B](#). None of the direct push borings installed north of the deep extraction well (i.e., 69DP0105, 69DP0106, 69DP0107, and 69DP0108) were completed with piezometers or monitoring wells. Based on the data collected at these locations



north of the deep extraction well (presented in Section 3.2.1.1), it was concluded that additional permanent monitoring locations were not required in this area.

The location and elevation for direct push borings were estimated from two-foot contour topographic coverage obtained from a 1997 AFCEE-sponsored mapping project of the MMR area. Locations at which piezometers or monitoring wells were installed were surveyed for horizontal and vertical position in the Massachusetts State Plane Coordinate System North American Datum of 1927 and National Geodetic Vertical Datum of 1929.

## **2.3 PUSH-POINT SAMPLING**

A hand-driven push-point sampler was used to collect shallow groundwater from immediately beneath the western bog ditch of the East Thompson Bog at 16 locations during August 2006 ([Figure 2-1](#)). The screened portion of the push-point sampler was typically advanced to an approximate depth of one to two feet below the bottom of the bog ditch. The locations of each push-point sample were estimated from two-foot contour topographic coverage. This sampling was completed to determine whether EDB contaminated groundwater was discharging to the western bog ditch of the East Thompson Bog at detectable levels.

## **2.4 HYDRAULIC MONITORING**

Synoptic water level measurements were collected from a SPEIM network of 47 monitoring wells and piezometers, and one staff gauge located in the vicinity of the FS-28 ETD system in October 2004. Supplemental synoptic water level surveys were conducted at three different times: (1) May 2005 at 31 monitoring wells and piezometers; (2) November 2005 at 43 monitoring wells and piezometers; and (3) March 2006 at 60 monitoring wells and piezometers, and two staff gauges located in the vicinity of the uncaptured portion of the plume. The May and November 2005 synoptic data were collected under “non-flooded” conditions at the cranberry bogs and the March 2006 synoptic data were collected when the cranberry bogs were flooded for frost protection. The FS-28 SPEIM and supplemental hydraulic monitoring locations are presented on

[Figure 2-2](#). Well construction information for all hydraulic monitoring locations is presented in [Table 2-1](#).

## **2.5 GROUNDWATER CHEMICAL MONITORING**

The groundwater data collected in support of this evaluation were obtained under the SPEIM program through the sampling of 65 groundwater monitoring wells or piezometers at 40 locations, the deep extraction well (69EW0001), 96 of the 204 SWPs, four irrigation wells, one irrigation well sentry well, and the Coonamessett Public Water Supply Well (CWSW) (69PWS40960). The CWSW was connected to the Crooked Pond water treatment plant during August 2005 and is no longer being sampled. The sentry wells 69MW1279B and 69MW1279C will continue to be sampled on a quarterly frequency to monitor water quality upgradient of the CWSW. Monitoring frequencies varied from monthly, monthly during the cranberry growing season (i.e., April through October), to quarterly, semiannually, or annually depending on the objective of the monitoring. Groundwater chemical monitoring locations are presented on [Figure 2-3](#) and well construction information is included in [Table 2-1](#).

## **2.6 SURFACE WATER CHEMICAL MONITORING**

Between March and November 2005 surface water quality was monitored at 27 locations within the Coonamessett River and from cranberry bog ditches in bogs located between Hatchville Road and Pond 14 ([Figure 2-3](#)). Prior to June 2005, surface water locations were monitored at monthly, quarterly or annual frequencies depending on the proximity of the plume to the sample location. Because EDB was detected in the surface waters of the Augusta Bog ditches in June 2005, as discussed in Section 3.3.2, the surface water monitoring frequency was increased to monthly for all locations north of Pond 14 through October 2005. The Augusta Bog monitoring location (69SW2001) was also sampled in November 2005. Additionally, surface water quality was monitored near recreational beaches at Coonamessett Pond and Round Pond during April and July 2005 and Jenkins Pond during October 2005. Surface water chemical monitoring locations are presented on [Figure 2-3](#) and location information is included in [Table 2-1](#).

### 3.0 RESULTS AND ANALYSIS

This section presents the results of the drilling and monitoring activities performed between April 2004 and March 2006 that support this FS-28 2005 plume update. Groundwater hydraulic monitoring results and the supporting precipitation record are presented on [Figure 3-1](#), [Figure 3-2](#), [Figure 3-3](#), [Figure 3-4](#), [Figure 3-5](#), and [Figure 3-6](#) and [Table 3-1](#) and [Table 3-2](#); chemical sample results are presented in [Table 3-3](#) and [Appendix E](#); and lithologic information is presented in [Appendix A](#) and [Appendix C](#). Plan and cross-sectional views of the FS-28 plume are presented in [Figure 3-7](#), [Figure 3-8](#), [Figure 3-9](#), [Figure 3-10](#), [Figure 3-11](#), and [Figure 3-12](#). Surface water chemical monitoring locations and results are presented in [Figure 2-3](#) and [Table 3-4](#), respectively. Well construction and sampling location information is included in [Table 2-1](#).

#### 3.1 HYDROGEOLOGY

The hydrogeology of the aquifer south of the FS-28 ETD system was characterized using the available historic soil boring logs for 69MW1306A, 69MW1308, 69MW1309, and 69MW1318A; soil boring data collected during this investigation during the advancement of sonic borings 69MW0012A, 69PZ0004A, 69BH2000, and 69BH2001; and from purge rate and water quality data (e.g., turbidity and color) from 32 vertical profiling locations advanced with a direct push rig (69DP0101 through 69DP0131 and 69DP1006). Lithologic descriptions obtained from the sonic borings were the primary basis for the interpretations discussed in the following sections and presented on the cross-sections. However, qualitative information obtained from the review of the purge water data and field observations made during direct push drilling was used to infer changes in lithology.

The generalized lithology is presented in cross-sectional views on [Figure 3-8](#), [Figure 3-9](#), [Figure 3-10](#), [Figure 3-11](#), and [Figure 3-12](#). Detailed descriptions of lithology observed at the sonic drilling locations are presented on the soil boring logs ([Appendix A](#)) and incorporate the results of the grain size analyses ([Appendix C](#)); purge water characteristics observed at the direct-push locations are presented in [Appendix E](#).



### 3.1.1 Lithologic Descriptions

In the vicinity of the uncaptured portion of the plume at 69BH2000 and 69BH2001 ([Figure 2-1](#)) light yellowish-brown, medium- and fine-grained sands with trace silt were logged from the water table to an approximate elevation of -40 feet mean sea level (ft msl). Observed purge rates during the sampling of screens set in these sands ranged between 12 to 18 gpm. From -40 ft msl to -80 ft msl a unit of grey, fine-grained sand with little silt, interbedded with a dark grey silt or silty fine sand with trace clay was logged. Purge rates in this zone of silty fine sand and silt recorded during the sampling of groundwater ranged between 3.7 and 9.4 gpm. Immediately below the grey silty sand unit, light yellowish-brown to olive-brown, fine- to medium-grained sands with trace silt were logged from -84 to -200 ft msl. Purge rates for these medium to fine sands ranged between 11 and 14 gpm. Although the higher purge rates recorded for the sandier units may have been limited by the capacity of the pump used (i.e., actual purge rates could be higher), a relative comparison of purge rates recorded in the sandier units and the siltier units indicate that hydraulic conductivity contrasts exist between the two lithologic units.

The grey silty fine sand and silt unit observed at 69BH2001 between -40 ft msl and -80 ft msl is at a similar elevation to a greyish-brown silty fine sand with silt seams logged during a previous investigation at 69MW1306A,B (AFCEE 1997). The top of the grey silty fine sand unit was also observed at -40 ft msl at 69BH2000. However, this boring was advanced only to -75 ft msl (with no recovery from -70 to -75 ft msl) to meet the objectives of assessing the geology of the shallow portion of the aquifer near the East Thompson bog. Therefore, the bottom of this silty unit was not defined at 69BH2000. A review of purge water descriptions from direct push locations 69DP0104, 69DP0123, and 69DP0122, which are located adjacent to sonic locations 69MW1306, 69BH2001, and 69BH2000, respectively, indicate that purge water collected from elevations similar to where the grey silty fine sand units are logged in the adjacent cores is typically grey to dark grey and silty with abundant fine sands settling out in the flow-through cell (used to monitor water quality parameters during sampling). Purge water from the medium to fine sands located above or below the silty zone is typically described as light yellow to tan in color and ranges from very silty with trace fine sand to clear.

Dark grey, silty purge water with abundant fine sands was observed at one or more sampling intervals between -31 ft msl and -74 ft msl at most direct push locations advanced in the vicinity of the leading edge area (69DP0104, 69DP0111, 69DP0116, 69DP0112, 69DP0110, 69DP0117, 69DP0123, 69DP0118, 69DP0118, 69DP0131, 69DP0122, and 69DP0121) ([Figure 2-1](#)). South of 69DP0131, the presence of the silt layer, as inferred from purge water observations at direct push drilling locations, is less obvious.

The unit of dark grey silt and silty fine sand does not appear to be present as far north or west as sonic location 69MW0012A ([Figure 2-1](#)). At this location, light yellowish-brown medium- to fine-grained sands with trace silt was logged from the surface to an elevation of -135 ft msl. These sands are interbedded with thin (less than 5 feet thick) lenses of silt or gravelly sand. A unit of dark grey silt to sandy silt was logged from -135 to -185 ft msl, which is much lower in elevation than the silty unit observed at the borings located to the south and east in the area between the West Thompson Bog and the Coonamessett River (69MW1306AB, 69BH2000, and 69BH2001).

The unit of silt and silty fine sand observed between -40 and -80 ft msl at 69BH2001 and 69MW1306A was not logged at a similar elevation at sonic drilling location 69PZ0004A, which is located to the south near the southwestern corner of Pond 14 ([Figure 2-1](#)). The lithology at 69PZ0004A is comprised of light yellowish-brown, medium- to fine-grained sands with trace silt from the surface (17.49 ft msl) to -106 ft msl. An olive-grey silt with trace fine sand and clay was observed between -106 to -148 ft msl, which is at a lower elevation than the grey silty unit observed at 69BH2001. Beneath the relatively uniform silt layer at 69PZ0004A, interbedded grey and olive medium to fine sands with fine sands and silts were observed from -148 to -232 ft msl. Cobbles and poorly sorted gravel was generally observed from -232 ft msl to the bottom of the boring at -282 ft msl.

In summary, the aquifer in the vicinity of the leading edge portion of the plume, between Thomas B. Landers Road and Hidden Pond Way, appears to be comprised primarily of light yellow-brown, medium to fine sands with trace silt that appear to be divided into a shallow aquifer (above approximately -40 ft msl) and a deeper aquifer (below

approximately -80 ft msl) by a fairly continuous unit of grey, silty fine-grained sand interbedded with silt. This grey silty unit (-40 to -80 ft msl) was not observed as far north and west as 69MW00012A or as far south as 69PZ0004A and based on the lithology at 69BH2001 and purge water observations made during advancement of direct push borings, can only be inferred as far south as Hidden Pond Way. Accordingly, because specific lithologic data are lacking, uncertainty remains as to the areal extent and elevation of this grey silty fine sand unit between Hidden Pond Way and 69PZ0004A. The approximate areal extent of this grey silty fine sand unit that appears to be dividing the shallow and deeper sandy aquifer is shown on [Figure 2-1](#). This unit is also illustrated in cross sectional view on [Figure 3-9](#), [Figure 3-10](#), [Figure 3-11](#), and [Figure 3-12](#).

### **3.1.2 Estimates of Hydraulic Conductivity**

Hydraulic conductivity for select lithologic units in the vicinity of the uncaptured portion of the leading edge of the plume were estimated using grain size analyses from specific depth intervals at 69BH2000 and 69BH2001. Hydraulic conductivities were estimated by entering the grain size data into commercial software, SizePerm® (EasySolve Software, LLC, 1998), which then calculated the estimated hydraulic conductivity using either the Hazen or Beyer methods. The Hazen method was used for well sorted sands and the Beyer formula was used for poorly sorted sediments.

The estimated hydraulic conductivities for the well sorted medium to fine sands with little to trace silt that are located above and below the grey silty unit at 69BH2001 range between 25 and 132 feet per day (ft/day), which is similar to the range of hydraulic conductivities previously estimated (18 to 180 ft/day) for sands collected at 69MW1306 (AFCEE 1997). Estimated conductivities for well sorted sands at 69BH2001 are somewhat greater at 140 to 300 ft/day. The estimated hydraulic conductivities for the grey silty fine sand and silt unit observed at 69BH2000 and 69BH2001 range between 2.5 to 19 ft/day. A summary of the data used to estimate these hydraulic conductivity values is included as Table C-1 in [Appendix C](#).

### 3.1.3 Hydraulic Data

Hydraulic data collected in support of this FS-28 plume update include water levels collected during the routine SPEIM synoptic event on 27 October 2004. This synoptic event included wells near or within the hydraulic influence of the ETD system. The groundwater elevations calculated for the 27 October 2004 synoptic event are presented in [Table 3-1](#).

In addition, a supplemental synoptic event was conducted at wells located around the uncaptured portion of the plume in May 2005. Subsequent to this May 2005 event, expanded synoptic water level surveys were conducted in November 2005 and March 2006 as the leading edge investigation progressed and new monitoring points became available. The May 2005 synoptic data were used for a preliminary assessment of hydraulic conditions near the uncaptured portion of the plume. The results of this assessment were used to guide the placement of drilling locations where piezometers or monitoring wells were installed. The November 2005 and March 2006 synoptic data are the most comprehensive of the three supplemental synoptic data sets and are discussed further in this technical memorandum. Additionally, the November 2005 synoptic data were collected under non-flooded conditions at the Coonamessett River and associated cranberry bogs, while the March 2006 synoptic data were collected when the cranberry bogs were flooded. The SPEIM and supplemental synoptic data are presented in [Table 3-1](#). The groundwater hydraulic monitoring locations are shown in [Figure 2-2](#).

#### 3.1.3.1 SPEIM Synoptic Event

The groundwater contours based on the elevations recorded on 27 October 2004 are presented on [Figure 3-1](#). In addition to these contours based on the observed data, a set of contours based on predicted groundwater elevations using the 2002 FS-28 groundwater model (AFCEE 2003b) are shown on [Figure 3-1](#). The model predicted contours were generated from a steady state simulation with 69EW0001 and the SWP system operating at design pumping rates (i.e., 550 gpm and 200 gpm, respectively).

A review of the contours presented on [Figure 3-1](#) reveals that the horizontal component of hydraulic gradient (horizontal gradient) and direction of flow based on the measured data generally agree with the model-predictions of groundwater flow. Groundwater flow direction in the northern portion of the plume (north of Coonamessett Pond) is generally from north to the south. The direction of groundwater flow is more southwesterly south of Coonamessett Pond. Flow then appears to converge toward the Upper Baptist bogs and deep extraction well 69EW0001.

Groundwater elevations measured in October 2004 systematically dropped at most wells by an average of 0.28 feet compared to the March 2004 data (AFCEE 2004a). This decrease in groundwater elevations is attributed to the periods of lower precipitation that occurred over the region during the summer of 2004 ([Figure 3-2](#)).

### **3.1.3.2 Supplemental Synoptic Events**

The lithologic descriptions and hydraulic conductivity estimates collected during this investigation suggest that the aquifer south of Thomas B. Landers Road may be divided into shallower and deeper portions of higher conductivity sands that are separated by a fairly continuous, lower conductivity silty sand unit. Therefore, the November 2005 and March 2006 synoptic data sets were subdivided into a deep groundwater data set (screens deeper than -70 ft msl) and a shallow groundwater data set (screens shallower than -70 ft msl) in an effort to assess groundwater flow above and below this silty unit.

Synoptic data were processed using a contour-mapping program Surfer 8® (Golden Software, 2002) to create initial groundwater contours. The Surfer 8® generated contours were adjusted slightly to eliminate artifacts of the contouring process that would otherwise produce hydrologically unreasonable results. The March 2006 synoptic data included questionable measurements at 69PZ1287A and 69SG0046-04. The groundwater elevation at 69PZ1287A decreased by 4.86 feet between November 2005 and March 2006, and a similar response was not observed at other screens within this well cluster (69MW1287 and 69PZ1287B). Therefore, the depth to water measured at 69PZ1287A in March 2006 is considered to be erroneous and most likely the result of field measurement

error and was removed from the dataset. The water level measurement collected at staff gauge 69SG0046-04 was not used because the elevation of the Coonamessett river at this staff gauge is considered to be the result of flow manipulation with weir boards and not always reflective of the groundwater elevation in the adjacent aquifer. For both synoptic events, groundwater contours for the shallow portion of the aquifer are presented on [Figure 3-3](#) and [Figure 3-5](#), and for the deeper portion of the aquifer on [Figure 3-4](#) and [Figure 3-6](#).

In the vicinity of the uncaptured portion of the plume, the groundwater flow direction in both the shallow and deep parts of the aquifer (i.e., above and below the silty sand unit) south of Thomas B. Landers Road is primarily to the south. Where sufficient data density exists, groundwater flow toward the Coonamessett River in the shallow portion of the aquifer has been mapped to occur only immediately adjacent to the river.

The horizontal gradient in both the deep and shallow portions of the aquifer south of Thomas B. Landers Road are oriented primarily toward the south with a magnitude of approximately 0.002 in both November 2005 and March 2006, which is the same magnitude (0.002) previously calculated for the area immediately north of Thomas B. Landers Road (AFCEE 1997). Based on the pattern of hydraulic head depicted in [Figure 3-3](#), [Figure 3-4](#), [Figure 3-5](#), and [Figure 3-6](#), the horizontal component of hydraulic gradient affecting the uncaptured portion of the plume appears to be relatively uniform spatially and the same magnitude under both flooded and non-flooded conditions. The process of flooding and draining of the bogs appears to have reached steady-state by the time the measurements were made (measurements in November 2005 were approximately six months into the non-flooded period for all but the Augusta Bog, and measurements in March 2006 were approximately two months into the flooded period for the bogs). As a result, while changes in water levels were observed, the hydraulic gradients in the aquifer had equilibrated by the time the measurements were made.

Currently, groundwater elevations west of Pond 14 are unknown. However, additional well/piezometer clusters are currently being installed between Jenkins Pond and Pond 14 as part of the ongoing leading edge investigation (see Section 5.3). Once completed,

groundwater elevation data from these new locations will be collected and incorporated into the conceptual site model.

The vertical components of hydraulic gradient (vertical gradients) at select monitoring well/piezometer clusters located in the vicinity of the uncaptured plume are presented in [Table 3-2](#). As shown on [Table 3-2](#), the vertical gradients were measured between individual screens within a cluster and from deepest to shallowest setting in an effort to characterize the potential for vertical flow that may occur at different depths of the aquifer. However, at many locations the difference in hydraulic potential between closely spaced well screens within a cluster is less than 0.1 feet (i.e., a difference in groundwater elevation of 0.01 ft between 69PZ1302 and 69MW1302 in March 2006), which is likely within the range of field measurement and survey error. Therefore, the resulting vertical gradients at these locations are considered to be so low (less than  $1 \times 10^{-3}$ ) as to be immeasurable and that the gradient at these well screens is considered to be primarily horizontal. Those measurements that have a difference in hydraulic head potential of approximately 0.1 foot or more are considered to be reproducible and are discussed below. Well clusters at which a measurable vertical gradient were observed in one or both of the synoptic events are identified in [Table 3-2](#) and are listed as follows: 69MW1296; 69MW1297; 69MW1299; 69MW1302; 69MW1306; 69PZ0004; 69PZ0005; 69PZ0012; 69PZ0017; 69PZ0019; 69PZ0020; 69PZ1301; 69MW1308; 69MW1309; and USFW479 clusters.

Upward components of vertical gradient between the deepest and the shallowest screen setting within a cluster (from deeper aquifer to shallower aquifer) were measured at locations adjacent to the Coonamessett River: 69MW1299, 69MW1309, 69PZ0019, 69MW1301, 69PZ0005, and 69PZ0004; and along the northern portion of the Augusta bog at 69MW1297. Of these locations the maximum upward gradient was measured at the southwestern corner of Pond 14 (69PZ0004) during both synoptic events. The relatively large upward component of vertical gradient measured at 69PZ0004 during both rounds suggests a potential for the upward flow of groundwater in this area. At the remaining locations, the vertical component of hydraulic gradient is either approximately

equal to or an order of magnitude lower (0.0015 to 0.0006) than the horizontal component of gradient (0.002), suggesting that immediately adjacent to the river or ponds there is slight potential for upward flow of groundwater.

Downward vertical gradients between the shallowest and deepest screen settings within a cluster were measured at locations within the footprint of the plume at the southern edge of the Augusta Bogs (69MW1308, 69MW1302, 69MW1306) and at a location in the vicinity of the leading edge of the uncaptured plume (69PZ0017). At these locations, the downward component of vertical gradient, although relatively low in magnitude is an indication that groundwater flow in the vicinity of the plume between Thomas B. Landers Road and 69PZ0017 is primarily horizontal to slightly downward.

In summary, the hydraulic data collected during the two supplemental synoptic events at the leading edge suggest that the horizontal gradient of flow south of the FS-28 ETD system is uniform and primarily in a southerly direction under flooded and non-flooded conditions. The vertical gradients at many locations are very low (less than  $1 \times 10^{-3}$ ) therefore the potential for vertical flow (either upward or downward) is minimal (i.e., groundwater flow is primarily horizontal). At those locations where a definitive vertical component of hydraulic gradient was measured, the gradients were slightly upward at clusters located immediately adjacent to the Coonamessett River and Round Pond. Within the footprint of the plume the vertical component of hydraulic gradient at most locations is slightly downward, indicating that the plume is likely to stay at depth in the aquifer south of Thomas B. Landers Road.

#### **3.1.4 Average Linear Velocities**

Average linear velocities for groundwater within the well sorted medium to fine sands associated with the shallow and deep portions of the aquifer at the leading edge were calculated using the March 2006 measured horizontal hydraulic gradient of 0.002, an assumed effective porosity of 0.3, and the range of estimated hydraulic conductivities presented in Section 3.1.2. For groundwater in well sorted sands with estimated



hydraulic conductivity values between 104 and 180 feet per day (ft/day), the average linear groundwater velocity is estimated to be between 0.69 and 1.2 ft/day.

## **3.2 CHEMISTRY DATA**

### **3.2.1 Groundwater**

Groundwater data presented in the final FS-28 2004 SPEIM report (AFCEE 2004a) indicated that the FS-28 plume was divided into three distinct lobes: (1) the area of the plume upgradient of the deep extraction well; (2) the lobe migrating towards and being captured by the SWP system; and (3) the southern uncaptured portion of the plume. The 2004 SPEIM report also identified two areas of the FS-28 plume that required additional characterization: (1) the uncaptured portion of the plume; and (2) the area immediately upgradient (or north) of the deep extraction well. In response, direct push drilling was used to further characterize the FS-28 plume in these areas. In addition to the direct push drilling, sonic drilling was employed at four locations to obtain characterization data (i.e., groundwater vertical profile data and/or lithologic data). This section presents the chemical data collected during these additional characterization activities, as well as the monitoring data collected during the routine SPEIM sampling events.

#### **3.2.1.1 Upgradient and in the Vicinity of the Treatment System**

This section discusses groundwater quality and trends in the plume areas upgradient and in the vicinity of the groundwater extraction systems. Accordingly, the discussion is focused on the FS-28 plume upgradient (i.e., north) of Coonamessett Pond, between Coonamessett Pond and the deep extraction well (69EW0001), and between the deep extraction well and the SWP system.

#### **Upgradient Plume Monitoring**

The extent of the northern (upgradient) portion of the FS-28 plume (north of the western arm of Coonamessett Pond) is monitored annually through the sampling of ten monitoring wells (69MW1271, 69MW1272, 69MW1275, 69MW1400A, 69MW1401,

69MW1403, 69MW1404, 69MW1411, 69MW1416, and 69MW1419) ([Figure 2-3](#)). EDB detections at these locations ranged from below the reporting limit (BRL) to 0.104 µg/L ([Table 3-3](#)). The trailing edge of the plume is located immediately north of Boxberry Hill Road, as indicated by the sub-MMCL EDB groundwater concentrations reported in the northern most wells 69MW1419 (BRL), 69MW1416 (0.018 µg/L), 69MW1271 (BRL), and 69MW1272 (0.019 µg/L) ([Figure 2-3](#) and [Table 3-3](#)). This portion of the FS-28 plume is shown in plan view on [Figure 3-7](#) and in cross-sectional view on [Figure 3-8](#).

In general, EDB concentrations have decreased in the northern portion of the plume with the exception of 69MW1411, which increased slightly from nondetect (AFCEE 2004a) to 0.010 µg/L and 69MW1416, which increased slightly from 0.011 µg/L (AFCEE 2004a) to 0.018 µg/L ([Table 3-3](#)).

### **In-Plume Monitoring in the Vicinity of the Deep Extraction Well**

The EDB concentrations in the vicinity of the deep extraction well (69EW0001) are monitored through the sampling of 13 monitoring wells (69MW1284A,B; 69MW1285A,B; 69MW1303A,B; 69MW1304, 69MW1317A,B; 69MW1278, 69MW1283A,B; and 69MW1310) ([Figure 2-3](#)). In addition to the monitoring wells sampled, vertical profile groundwater samples were collected at six direct push drilling locations (69DP0101, 69DP0105, 69DP0106, 69DP0107, 69DP0108, and 69DP0109) ([Figure 2-1](#), [Appendix E](#)). The locations of the extraction well, vertical profile locations, and the monitoring wells are shown in plan view in [Figure 2-1](#), [Figure 2-3](#), and [Figure 3-7](#). Cross-sectional views of the plume are shown on [Figure 3-8](#) and [Figure 3-9](#).

EDB continues to be detected above the MMCL in groundwater sampled from monitoring wells between the western arm of Coonamessett Pond and the deep extraction well 69EW0001. Generally, EDB concentrations were lower in this portion of the plume than reported in the 2004 SPEIM report (AFCEE 2004a), with the exception of groundwater sampled from 69MW1283A, where the EDB concentration increased from

0.479 µg/L in March 2003 (AFCEE 2004a) to 1.32 µg/L during April 2004, and then decreased to 0.996 µg/L in March 2005 ([Table 3-3](#)).

EDB concentrations decreased in groundwater sampled from four wells located within approximately 850 feet and upgradient of the deep extraction well, specifically 69MW1284A,B, 69MW1304, and 69MW1310 ([Figure 2-3](#), [Table 3-3](#)). EDB concentrations at 69MW1310 (mid-screen elevation -202 ft msl) decreased from 2.87 µg/L in May 2004 to 1.14 µg/L in April 2005. EDB concentrations detected in samples from 69MW1304 (mid-screen elevation -181 ft msl) declined from 2.84 µg/L in May 2004 to 1.87 µg/L in September 2005.

Monitoring wells 69MW1284A (mid-screen elevation -180 ft msl) and 69MW1284B (mid-screen elevation -216 ft msl) are located approximately 55 feet north (upgradient) of the deep extraction well. The EDB concentration in 69MW1284A decreased from 2.94 µg/L in April 2004 to 2.32 µg/L in September 2005. This well is screened approximately eight feet below the extraction well screen. Samples from monitoring well 69MW1284B contained EDB concentrations ranging from 3.84 µg/L in April 2004 to 2.98 µg/L in September 2005. Relative to the extraction well, 69MW1284B is screened approximately 44 feet deeper. It should be noted that this portion of the plume is within the capture zone of the deep extraction well pumping at the current design rate of 550 gpm ([Figure 3-14](#)) (AFCEE 2004a).

Direct push drilling was used to characterize the upper boundary of the plume at four locations upgradient of the deep extraction well (i.e., 69DP0105, 69DP0106, 69DP0107, and 69DP0108) ([Figure 2-1](#), [Appendix E](#)). Direct push drilling location 69DP0107 is located adjacent to monitoring well 69MW1283, approximately 1,250 feet north of the deep extraction well. EDB was not detected in the samples collected from this location because groundwater samples could only be collected to a depth of 97 ft bgs (60.5 ft msl) due to the refusal encountered at this depth in the borehole. As a result, this direct push location did not reach the depth required to characterize the top of the plume ([Figure 3-8](#)).

The upper boundary of the plume at 69DP0106, which is adjacent to 69MW1310, was observed at an elevation of approximately -120 ft msl ([Figure 3-6](#); [Table 3-3](#)). This is shallower than the elevation determined during the installation of 69MW1310 in January 1997 when the top of the plume was detected at approximately -150 ft msl (AFCEE 1997). The upper boundary of the plume at 69DP0105 (which was installed adjacent to 69MW1304 and to the south west of 69DP0106) was encountered at approximately -85 ft msl, which is similar to the elevation determined during the installation of 69MW1304 in 1997 when the plume was observed at approximately -90 ft msl (AFCEE 1997).

The upper boundary of the plume at 69DP0108 (which is adjacent to the 69MW1284A,B well cluster and approximately 250 feet south of 69DP0108) was observed at approximately -136 ft msl. The upper boundary of the plume at this location is now considerably deeper than the elevation of the upper boundary in 1996 (between -88 and -107 ft msl) when 69MW1284 was installed. The vertical collapse of the plume at this location is likely due to the operation of the deep extraction well.

The results of the direct push drilling conducted north of 69EW0001 revealed that the upper boundary of the plume is not at a consistent elevation. The top of the plume is at a similar elevation as observed in 1997 at 69DP0105, shallower at 69DP0106, and deeper at 69DP0108. These results likely indicate that the upper boundary of the plume is influenced by the hydraulic flow field in the aquifer and the stress caused by pumping of the deep extraction well. It is important to note that this portion of the plume is well within the model predicted capture zone of the deep extraction well ([Figure 3-14](#)) (AFCEE 2004a).

The eastern boundary is monitored at four locations (69MW1271, 69MW1312, 69MW1313, and 69MW1411) ([Figure 2-3](#), [Table 3-3](#)). Based on recommendations in the final 2004 SPEIM report (AFCEE 2004a), monitoring wells 69MW1312 and 69MW1313 were added to the SPEIM program to address uncertainty in the delineation of the eastern boundary of the plume. Groundwater samples from the eastern boundary wells either did not contain EDB in 2004 and 2005, or contained EDB at concentrations below the

MMCL of 0.02 µg/L. Based on the sample results at 69MW1313, the eastern boundary of the plume has been redefined approximately 375 feet to the west of the prior delineation that was presented in the final 2004 SPEIM report.

The western boundary of the northern portion of the plume is monitored at three wells (69MW1311, 69MW1404, and 69MW1416). Similar to 69MW1312 and 69MW1313 discussed above, 69MW1315 was added to the SPEIM program to address uncertainty in the delineation of the southwestern boundary of the plume. EDB concentrations in groundwater sampled from this well increased from 1.47 µg/L in September 2004 to 1.62 µg/L in April 2005. Consequently, the southwestern boundary of the plume has been revised based on the data collected at 69MW1315 ([Figure 2-3](#)). These results are further discussed in the development of the 2006 plume shell in Section 3.2.1.3. Based on modeling predictions presented in the final FS-28 2004 SPEIM report (AFCEE 2004a), the portion of the aquifer monitored by 69MW1315 is within the capture zone of the deep extraction well. To further define the western extent of the plume in this area, monitoring of existing wells are recommended in Section 5.3.3.

Monitoring wells 69MW1303A (mid-screen elevation -174 ft msl) and 69MW1303B (mid-screen elevation -215 ft msl) are located approximately 140 feet south of the deep extraction well, but are believed to be within the capture zone of the deep extraction well based on model predictions (AFCEE 2004a). During this investigation EDB concentrations at 69MW1303A decreased from 0.018 µg/L in May 2004 to nondetect in September 2004, and increased to BRL during April and September 2005 ([Table 3-3](#)). Generally EDB concentrations in samples collected from 69MW1303A have shown a decreasing trend since 1997 (AFCEE 2004a). This well is screened adjacent to the bottom of the screened interval of the deep extraction well screen ([Figure 3-8](#) and [Figure 3-9](#)). During this investigation, EDB concentrations at 69MW1303B were BRL during May and July 2004, decreased to nondetect in September 2004, increased to 0.022 µg/L in April 2005 and decreased to 0.014 µg/L during September 2005 ([Table 3-3](#)).

The area of the plume between the deep extraction well and the SWP system is monitored at five wells: 69MW1317A,B,C and 69MW1285A,B ([Figure 2-3](#)). Monitoring well 69MW1317A (mid-screen elevation -142 ft msl) is located approximately mid-way between the deep extraction well and the SWP system. Based on predictions using the FS-28 groundwater model, this location is downgradient of the deep extraction well capture zone but within the capture zone of the SWP system (AFCEE 2004a). In March 2005, AFCEE installed 69MW1317C (mid-screen elevation -59.7 ft msl) to monitor EDB concentrations identified during the collection of groundwater vertical profile data at 69DP0109 in August 2004. EDB was detected at concentrations above the MMCL of 0.02 µg/L at 69DP0109 in vertical profile samples collected between -45 ft msl and -85 ft msl ([Figure 3-9](#) and [Appendix E](#)). The maximum EDB concentration (0.063 µg/L) was detected from the sample interval of -55 to -65 ft msl. EDB was not detected in samples from 69MW1317A or 69MW1317B,C except during July 2004 and August 2005, respectively, when concentrations were BRL ([Table 3-3](#)). The data collected at the monitoring wells screens since the installation of the direct push boring suggests the EDB detected during the vertical profiling at 69DP0109 in August 2004 has migrated south of this well cluster towards the SWP extraction system ([Figure 3-9](#)).

The monitoring well cluster 69MW1285A,B is located immediately north of the SWP system. The shallow well (69MW1285A, mid-screen elevation -34.4 ft msl) is used to monitor groundwater within the capture zone of the SWP system (AFCEE 2004a). Groundwater vertical profile data collected at 69DP0101 during May and June 2004 indicted the presence of EDB above the MMCL at mid-screen sampling elevations of -18 to -68 ft msl with concentrations ranging from 0.044 µg/L to 2.08 µg/L. In addition, a detection of 0.047 µg/L was reported at a mid-screen sample elevation -108 ft msl, and at a mid-screen elevation of -178 ft msl at a concentration of 0.049 µg/L ([Figure 3-9](#) and [Appendix E](#)). The declining EDB concentrations measured in groundwater samples from 69MW1285A (i.e., 0.399 µg/L in May 2004 to 0.016 µg/L in September 2005) indicate the EDB mass detected during the installation of 69DP0101 between -18 and -68 ft msl has migrated south towards the SWP system ([Figure 3-9](#)). EDB was detected BRL or not detected in samples from the deeper well screen in this cluster (69MW1285B, mid-screen elevation -154 ft msl).

The declining EDB concentration trend at 69MW1303A presented in the 2004 SPEIM report (AFCEE 2004a), and the low EDB concentrations measured in the groundwater samples from this well cluster during this investigation, indicate that the northern portion of the plume is being captured by the deep extraction well. Additionally, the vertical profile data collected from 69DP0101 and 69DP0109, and the monitoring data collected from 69MW1285A,B; and 69MW1317A,B,C support the conclusion that the portion of the plume migrating towards the SWP extraction system is no longer being supported by EDB contaminated groundwater from the northern portion of the plume.

As part of the 2004 and 2005 FS-28 SPEIM program, the CWSW and two associated sentry wells are sampled. The CWSW is located near the western boundary of the FS-28 plume ([Figure 2-3](#)) and is screened at approximately -20 to -30 ft-msl. The top of the FS-28 plume is located approximately 70 feet below the CWSW. Pre-treated water from the CWSW (69PWS40960) remained nondetect for EDB based on monthly sampling conducted between April 2004 and February 2005 ([Table 3-3](#)). Since sampling began in 1997, EDB has never been detected in samples from this supply well.

The CWSW sentry wells (69MW1279B,C), located about 140 feet northeast and hydraulically upgradient of the CWSW, are screened from -62.8 to -67.8 and -103.0 to -108.0 ft msl, respectively. EDB was not detected in groundwater samples collected from 69MW1279B, the shallower of the two monitoring wells. However, in the deepest well in the cluster (69MW1279C, screened at a depth approximately 70 feet below the CWSW) EDB was detected at concentrations that ranged from 0.012 to 0.036 µg/L. [Table 3-3](#) shows that only two of 17 samples contained EDB at concentrations equal to or greater than the MMCL of 0.02 µg/L. The range of EDB concentrations detected at 69MW1279C ([Table 3-3](#)) are similar to the range of concentrations observed in the past (AFCEE 2004a). The data collected from the CWSW and the shallow monitoring well (69MW1279B) support the conclusion the FS-28 plume is not impacting the CWSW.

### **In-Plume Monitoring Lateral To and Immediately Downgradient of the SWPs**

Monitoring of the plume cross-gradient and immediately downgradient of the SWPs is achieved by sampling five locations: 69MW1291A, 69PZ1291A,B; 69MW1294, and 69MW1296A ([Figure 2-3](#)). Monitoring well 69MW1291A, with a 5-foot screen interval centered at -83.5 ft msl, is located approximately 20 feet west of the SWP system. EDB was not detected in any of the samples collected from 69MW1291A ([Table 3-3](#)). EDB was not detected in samples collected from 69PZ1291A, which has a 5-foot screen interval centered at 16.5 ft msl. However, EDB was detected in 69PZ1291B and the concentration decreased from 0.368 µg/L (May 2004) to BRL (September 2005). This well consists of a 5-foot screen centered at -18.5 ft msl, suggesting that the base of the FS-28 plume at this location has risen within the aquifer, possibly due to the hydraulic stress applied by the SWP system. This conclusion is supported by the elimination of EDB detections in 69MW1291A (mid-screen elevation -83.5 ft msl and which is screened approximately 65 feet deeper than 69PZ1291B) after May 1999, one month after the startup of the SWP system. EDB has not been detected in 69MW1291B since sampling began in 1999 (AFCEE 2004a). The vertical depiction of the plume at this location is shown on [Figure 3-9](#).

Monitoring well 69MW1296A is screened deeper in the aquifer (5-foot screen centered at approximately -144 ft msl) and is located approximately 285 feet west of the SWP system ([Figure 2-3](#)). EDB was not detected at 69MW1296A ([Table 3-3](#)).

Monitoring well 69MW1294 is located approximately 120 feet southwest of the southern end of the SWP system, and is relatively shallow (mid-screen elevation -18 ft msl) with a well screen approximately 30 feet deeper than the SWP screens ([Figure 2-3](#)). EDB concentrations were below the MMCL of 0.02 µg/L at this well ([Table 3-3](#)).

#### **3.2.1.2 Downgradient of the Treatment System**

As a result of the increased pumping rate at 69EW0001 that began in April 2003 (AFCEE 2003b), the capture zone of the deep extraction well has expanded, and the monitoring and vertical profile data suggest that the plume north of 69EW0001 is being captured.



Accordingly, the uncaptured portion of the FS-28 plume downgradient of the deep extraction well appears to have become detached ([Figure 3-9](#)).

The leading edge of the plume was monitored and characterized using data collected from 26 monitoring wells and piezometers (69PZ0100, 69PZ0101, 69MW1286, 69MW1297, 69MW1298, 69PZ1298A,B; 69MW1300A,B; 69PZ1300A,B; 69MW1301, 69PZ1301A,B; 69MW1302, 69PZ1302A,B; 69MW1306A,C; 69MW1308, 69MW1308A,B; 69PZ1309A,B; 69MW1318A, and 69PZ1318) ([Figure 2-3](#)). In addition to the monitoring data collected from wells and piezometers, groundwater vertical profile data were collected from 25 direct push and three sonic drilling locations during the investigation.

Analyses of these data indicate the uncaptured portion of the plume has two distinct lobes: one relatively shallow and one relatively deep. The shallow lobe is approximately 3,200 feet long and is located between an elevation of approximately 6.7 and -54.5 ft msl ([Figure 3-12](#)). The shallow lobe is approximately 20 feet thick at the trailing edge (69DP0103) and increases to approximately 27 feet thick at 69DP0113, and narrows to less than 10 feet thick at the leading edge (69DP0123). This lobe contains a maximum EDB concentration of 0.381  $\mu\text{g/L}$  detected at the southwestern edge of the Augusta Bog at 69DP0113 ([Figure 3-10](#), [Appendix E](#)). The shallow lobe extends from the southwest corner of the Lower Baptiste Bog to just south of the intersection of Turner Road and Hidden Pond Way ([Figure 3-9](#), [Figure 3-10](#), [Figure 3-11](#), and [Figure 3-12](#)). Based on the groundwater flow data presented in Section 3.1 and the general distribution of EDB concentrations greater than the MMCL, the shallow lobe is migrating in a south-southeasterly direction toward the Coonamessett River. However, due to the relatively low EDB concentrations and mass in this portion of the plume, EDB has not been detected in the river.

The deep lobe of the plume is approximately 3,400 feet long, located between an elevation of -76 and -183 ft msl, has an average thickness of approximately 70 feet, and contains EDB at a maximum concentration of 4.05  $\mu\text{g/L}$  in the trailing edge of the uncaptured portion of the plume (i.e., 69DP0102), and decreases to a maximum

concentrations of 0.193 µg/L at the leading edge (i.e., 69DP0131) ([Figure 3-9](#), [Appendix E](#)). The deep lobe of the uncaptured portion of the plume is migrating in a southerly direction within a sandy aquifer unit below a siltier layer located at an elevation of approximately -70 ft msl. A cross-sectional depiction of the shallow and deep plume lobes, approximately perpendicular to groundwater flow, is shown on [Figure 3-10](#) and [Figure 3-12](#).

Monitoring well 69MW1318A (mid-screen elevation -130 ft msl) is the northern most well that is screened within the deep lobe of the uncaptured portion of the FS-28 plume. EDB concentrations have decreased below the 3.7 µg/L reported in December 2003 (AFCEE 2004a) to 0.209 µg/L in September 2005. The recent decrease in the EDB concentration at this well is a reversal in the trend observed in the 2004 SPEIM report (AFCEE 2004a) indicating the higher EDB mass may have migrated downgradient of 69MW1318A.

Monitoring well 69MW1300A (mid-screen elevation -1.3 ft msl) is the northernmost well screened within the shallow lobe of the plume, and piezometer 69PZ1302A (mid-screen elevation 9 ft msl) is the southernmost well currently monitored under the SPEIM program. The EDB concentration at 69MW1300A increased from nondetect to 0.336 µg/L between April 2004 and July 2005, and decreased to 0.162 µg/L in September 2005. EDB was detected at a concentration of 0.027 µg/L at 69PZ1302A during August 2005. This result was similar in magnitude of the EDB concentration measured in the vertical profile sample collected from a mid-screen elevation of 3.2 ft msl at 69DP0113 (0.034 µg/L) located approximately 25 feet west of 69PZ1302A during December 2004 ([Figure 2-1](#) and [Figure 3-10](#), [Appendix E](#)). Monitoring well 69MW1300B (mid-screen elevation -76.4-ft msl) is screened just above the deep lobe of the plume. During this investigation, EDB was either not detected or at BRL concentrations. These data indicate that the plume is migrating below the well screen at 69MW1300B ([Figure 3-9](#)).

Monitoring wells 69MW1306A (mid-screen elevation -81.8 ft msl) and C (mid-screen elevation -117.8 ft msl) are currently the most southern and the most downgradient wells monitored under the SPEIM program that are screened within the deep lobe of the

uncaptured portion of the plume. EDB concentrations detected in 69MW1306A ranged from 0.015 µg/L in April 2004 to 0.507 µg/L in September 2005, and was BRL in 69MW1306C during November 2005. The EDB concentrations measured at 69MW1306A and C in September 2005 were not consistent with the vertical profile data collected at 69DP0104 during June 2004 ([Figure 3-9](#), [Table 3-3](#), [Appendix E](#)). These results show the heterogeneity of the distribution of EDB within the deep lobe of the plume.

Additionally, to determine if the shallow lobe of the uncaptured portion of the FS-28 plume was discharging to the western ditch of the East Thompson cranberry bog, 16 shallow groundwater samples were collected on a one-time basis in August 2005 from approximately one to two feet below the bog ditch using a push-point sampler ([Figure 2-1](#)). EDB was not detected in any of these samples. Surface water was also sampled for EDB at four locations: 69SW4003, 69SW4004, 69SW4005, and 69SW4006 within the western bog ditch during August 2005. EDB was not detected at any of these surface water samples. Additionally, groundwater vertical profiling was conducted at three locations (i.e., 69DP0120, 69DP0121, and 69DP0122) along the western perimeter road of the East Thompson Bog ([Figure 2-1](#)). EDB was not detected in any of these vertical profile samples ([Appendix E](#)). Therefore, based on an evaluation of these data, the plume does not appear to be discharging to the western ditch of the East Thompson cranberry bog.

### **3.2.1.3 Plume Shell**

The 2006 FS-28 EDB plume shell is shown in [Figure 3-13](#) and [Figure 3-14](#). Assuming an aquifer porosity of 30 percent, the volume of EDB contaminated groundwater and the EDB mass in the 2006 plume shell are  $2.60 \times 10^8$  cubic feet (ft<sup>3</sup>) and 5.41 pounds (lbs), respectively. This contaminant mass is spatially distributed such that 4.99 lbs (or 92 percent of the total plume mass) of EDB in the plume is located north of 69EW0001 in the main FS-28 plume, 0.008 lbs (or 0.15 percent) between 69EW0001 and the SWP system, and 0.42 lbs (or 8 percent) south of the SWP system (uncaptured portion). This compares to a plume volume and mass of  $2.25 \times 10^8$  ft<sup>3</sup> and 5.91 lbs, respectively, for the

2003 version of the plume shell (also shown on [Figure 3-13](#) for comparison along with the 2001 version of the FS-28 plume shell).

North of deep extraction well 69EW0001, the plume shell mass has decreased and the volume has increased compared to the 2003 plume shell version. Samples collected from direct push locations 69DP0105, 69DP0106, and 69DP0108 have increased the vertical thickness of the plume shell immediately north of the deep extraction well. The western boundary of the 2006 plume shell was extended approximately 400 feet westward from just north of the deep extraction well to 69MW1416 because of the EDB detection at 69MW1315 (1.62 µg/L in April 2005). Monitoring well 69MW1315 was not sampled for the 2003 plume shell update. Also, nondetect samples from well 69MW1313, during 2004 and 2005, which was not sampled for the 2003 plume shell update, has redefined the eastern plume shell boundary (approximately 375 feet westward) in the vicinity of that well.

In the vicinity of the SWP system, the 2006 plume shell has less contaminant mass and volume than the 2003 version of the plume shell. These reductions in plume mass and volume can most likely be attributed to the operation of the SWP system. The most recent samples collected in 2005 from wells 69MW1285A,B and some of the shallow well points have lower EDB concentrations than samples collected for the 2003 plume shell.

South of the SWP system, samples collected from the drilling locations have refined the delineation of the uncaptured portion of the plume resulting in less mass and more volume in this portion of the 2006 plume shell when compared to the 2003 plume shell. The mass in the uncaptured portion of the 2003 plume shell is based on two monitoring well sample results, 3.7 µg/L at 69MW1318A and 0.26 µg/L at 69MW1306A (AFCEE 2004a). The mass of the 2006 plume shell was based on the monitoring well and drilling data collected in support of this plume update and detailed in Section 3.3. The 2006 plume shell extends more than 1,500 feet further south than the 2003 plume shell, is narrower, and has an additional shallow lobe that extends southeastward toward the Coonamessett River.

In summary, a comparison of the 2006 and 2003 plume shells presented on [Figure 3-13](#) clearly shows a different representation of the spatial distribution and magnitude of EDB concentrations in the FS-28 plume. The changes are mainly due to the acquisition of additional data in the core of the plume north of 69EW0001 and in the uncaptured portion of the plume, and the successful operation of the FS-28 ETD system. It should be noted that [Figure 3-14](#) also shows the 2006 plume shell and model-predicted capture zones for the FS-28 ETD system presented in the final 2004 SPEIM report (AFCEE 2004a).

### **3.2.2 Surface Water**

During 2005, 27 Coonamessett River and associated bog ditch locations were monitored at various frequencies ([Figure 2-3](#)). Surface water quality was also monitored near recreational beaches at three ponds (i.e., Coonamessett Pond, Round Pond, and Jenkins Pond) in the vicinity of the FS-28 plume as part of the recreational beach monitoring program. EDB was not detected in surface water samples collected with the exception of samples collected from two Augusta Bog locations (69SW0060 and 69SW2001) between June and October 2005 ([Table 3-4](#)).

Surface water location 69SW2001 was sampled to monitor water quality in the northern portion of the Augusta bog. Surface water sampled between June and October 2005 contained EDB at a maximum concentration of 0.012 µg/L, which was below the human health screening level risk-based concentration (for a  $10^{-3}$  cancer risk) of 7.71 µg/L (AFCEE 2003b), the ecological screening-level benchmark of 31 µg/L (AFCEE 1998a) and the MMCL of 0.02 µg/L. Location 69SW0060 was sampled to monitor the water quality of surface water flowing out of the Augusta Bog and into the Augusta Bog irrigation pond. EDB was only detected in surface water sampled from this location on 13 June 2005 at a concentration BRL. Prior to June 2005, EDB has not been detected in surface water samples collected from 69SW0060 or 69SW2001 since February 1999. During July and August 2005 surface water was also sampled from the Augusta Bog irrigation pond. Samples were collected from the surface of the pond and from approximately 15 feet below the pond surface. EDB was not detected in the samples collected from the irrigation pond.

## 4.0 CONCEPTUAL SITE MODEL UPDATE

### 4.1 PREVIOUS CONCEPTUAL SITE MODEL

The FS-28 plume was characterized in 1997 (AFCEE 1997). At that time a conceptual site model (CSM) was developed and described the FS-28 plume as a detached plume that originated at an unidentified source on the MMR. The data indicated that the plume was migrating southward, flowing under the western arm of Coonamessett Pond (between approximately -70 and -250 ft msl). To the south of Hatchville Road, the plume was believed to rise in the aquifer to discharge to the Coonamessett River and associated cranberry bogs. However, based on subsequent monitoring data, the entire vertical extent of the EDB plume does not appear to upwell to the river and bogs.

Groundwater modeling presented in the *Final Fuel Spill-28 2002 Annual System Performance and Ecological Impact Monitoring Report* (AFCEE 2003b) indicated that after startup of the remedial system, a portion of the plume located south of the influence of the ETD system (between approximately -70 and -150 ft msl) would continue to migrate south, converge into a narrow plume, and then rise gradually in the aquifer to ultimately discharge to the Coonamessett River north of Pond 14. Modeling simulations presented in the final 2004 FS-28 SPEIM report showed a similar fate for this uncaptured portion of the plume (AFCEE 2004a).

The leading edge of the uncaptured portion of the plume was defined by EDB detections in groundwater screening samples from 69MW1300 and by nondetects in groundwater screening samples at downgradient borings 69MW1302, 69MW1308, and 69MW1306. Based on data collected through March 2004, the extent of the uncaptured portion of the plume was revised to reflect higher EDB concentrations detected at 69MW1318A (3.7 µg/L in December 2003) (AFCEE 2004a). This increase in EDB was attributed to the migration of EDB formerly upgradient of 69MW1318A but not within the 69EW0001 capture zone. In addition, detections of EDB at 69MW1302 and 69MW1306A indicated that the leading edge of the uncaptured portion of the plume had migrated south of these monitoring wells. At that time, no groundwater monitoring points existed south of the

69MW1306 well cluster. The increase in EDB concentrations observed at 69MW1306 led to a recommendation to investigate the area south of Thomas B. Landers Road (AFCEE 2004a).

## **4.2 REVISED CONCEPTUAL SITE MODEL**

The data evaluated for this FS-28 plume update indicate the plume north of 69EW0001 and the shallow portion of the plume in the vicinity of the SWP system continue to decrease in mass with continued operation of the ETD system. Evaluation of the monitoring and investigation data presented in this technical memorandum has led to a refinement of the depiction of the plume north of 69EW0001. This refinement includes a general westward shift in the delineation of the plume north of 69EW0001 and an overall reduction in EDB contaminant mass based on generally lower EDB concentrations.

The uncaptured portion of the plume, located south of the influence of the ETD system, was characterized using drilling and monitoring data collected in support of this plume update. In particular, the focus of this effort was to determine the extent of the plume located south of Thomas B. Landers Road which was previously uncharacterized. The new data collected during the drilling investigation indicate that this uncaptured portion of the plume appears to bifurcate into a deep and shallow lobe. The shallow lobe of the plume appears to be migrating south-southeast in a sandy part of the aquifer toward (and possibly discharging to) the Coonamessett River north of Pond 14. The southern extent of this shallow lobe is relatively thin (10 to 30 feet thick vertically), is approximately 20 to 50 feet below ground surface, and contains relatively low EDB concentrations (i.e., less than 0.1 µg/L). Therefore, based on the current characterization of this shallow lobe, it is not likely that EDB will be detected in surface water samples collect from the Coonamessett River between Thomas B. Landers Road and Pond 14.

The new characterization data indicate that the deep leading edge lobe is also migrating in a sandier portion of the aquifer (between -70 and -150 ft msl). Lithologic information indicates that the sandy portions of the aquifer that contain the shallow and deep lobes are separated by a silty sand. The deep lobe appears to remain at depth in the aquifer

(in excess of 100 feet below ground surface) below the silty sand and continues to migrate south, parallel to and west of the Coonamessett River. The deep lobe appears to be migrating on a more southerly trajectory than the shallow lobe. The leading edge of the deep lobe is located south of 69DP0131 (Hidden Pond Way) where the top of the plume is encountered approximately 140 feet below ground surface, is approximately 70 feet thick, and approximately 200 feet wide. The deep lobe appears to remain at depth due to the combination of a relatively strong component of horizontal flow and a slightly downward vertical component of hydraulic gradient within this portion of the aquifer. The presence of the silty sand unit may also be keeping this lobe deeper in the aquifer. The deep lobe remains relatively thick (vertically) along its identified length and is expected to continue to travel in a southerly direction, at its current depth in the aquifer, until it encounters a region of upward vertical gradients or a change in lithology (e.g., a discontinuity in the silty sand unit). However, there is considerable uncertainty in the ability to predict future migration of this deep lobe due to a lack of data south of its current location.

#### **4.3 ASSESSMENT OF PRIVATE WELLS IN THE STUDY AREA**

This updated CSM, including the revised delineation of the uncaptured portion of the plume, has warranted a re-assessment of the potential presence of private water supply wells in the vicinity of the uncaptured portion of the plume. AFCEE previously assessed the area for private wells in 1997. This prior assessment resulted in residences in this area on Hidden Pond Way, Turner Road, and Thomas B. Landers Road ([Figure 2-1](#)) being connected to the public water supply system by AFCEE in 1997. Therefore, there is no current risk of exposure to the plume through the use of private wells as a result of the revised plume delineation presented in this technical memorandum.

A recent assessment of private wells south of Sandwich Road (i.e., downgradient of the leading edge of the uncaptured portion of the plume) has identified several residences that may have private wells located hydraulically downgradient of the newly defined uncaptured portion of the plume. None of the residences identified are located closer than 600 feet to the plume as currently delineated. The residents that may have private



drinking water wells have been contacted by AFCEE and sampling of these private wells for EDB analysis is underway for those residents who requested sampling. The results of the residential well sampling will be presented to the regulators when the data are available.

## **5.0 CONCLUSIONS AND RECOMMENDATIONS**

The following section presents the conclusions drawn from the data evaluated in this technical memorandum, assesses areas of uncertainty, and presents recommendations.

### **5.1 CONCLUSIONS**

The spatial distribution of EDB contamination in the FS-28 plume has been updated based on a combination of monitoring data collected under the SPEIM program in 2004 and 2005 and new characterization data collected north of 69EW0001 and at the leading edge of the plume. In addition, the new characterization data has led to a better understanding of the hydrogeology south of Thomas B. Landers Road allowing for a revised FS-28 CSM.

The main conclusions drawn from this plume update are:

- The EDB concentrations in the plume within the capture zone of the FS-28 ETD system continue to show a general overall decreasing trend, primarily due to the operation of the remedial system. However, based on data collected during direct push drilling investigation, the plume upgradient of the deep extraction well is thicker than previously characterized.
- The western boundary of the plume north of the deep extraction well has been expanded approximately 400 feet to the west due to EDB detections at 69MW1315 (that was not previously monitored). Groundwater modeling performed in 2004 indicates the contaminant mass added on the western boundary of the plume is within the capture zone of the deep extraction well.
- The eastern boundary of the plume north of the deep extraction well has been redrawn approximately 375 feet west of its former location based on monitoring results at 69MW1313 (EDB not detected when sampled in 2004 or 2005).
- The nature and extent of the uncaptured portion of the plume has been successfully characterized using data collected during a direct push and conventional drilling program. The uncaptured portion of the plume is approximately 1,500 feet farther south than previously portrayed based on data collected through March 2004 (AFCEE 2004a).
- The uncaptured portion of the plume appears to be completely detached from the main plume to the north and consist of two distinct lobes: (1) a shallow lobe that is approximately 3,200 feet long, located between an elevation of approximately 6.7 and -54.5 ft msl, and containing a maximum EDB concentration of 0.381 µg/L; and

(2) a deep lobe approximately 3,400 feet long, located between an elevation of approximately -76 and -183 ft msl, and containing EDB concentrations as high as 4.05 µg/L.

- The shallow lobe appears to be migrating in a south-southeasterly direction towards the Coonamessett River. Because of the relatively low EDB concentrations in the shallow lobe, EDB is not expected to be detected in the Coonamessett River surface water if this shallow lobe discharges (or is discharging) to the river.
- The deep lobe is migrating in a southerly direction in a sandier portion of the aquifer beneath a silty sand layer that approaches 40 feet thick in some areas and separates the shallow and deep lobes of the plume.
- The mass of EDB in the 2006 plume shell is estimated to be 5.41 lbs. The majority of this EDB mass (approximately 5 lbs) remains upgradient and within the capture zone of the deep extraction well. A small portion of the EDB mass (approximately 0.008 lbs) remains within the capture zone of the SWP extraction system, and the newly characterized uncaptured portion of the plume contains approximately 0.42 lbs of EDB.
- To date, the hydraulic conditions influencing the migration of the plume are only known north of 69DP0131 (i.e., the intersection of Hidden Pond Way and Turner Road). Therefore, predictions regarding the fate and transport of the shallow and deep uncaptured portions of the plume south of Hidden Pond Way cannot be made at this time.
- Because of the apparent complex hydrogeology and hydraulic flow field south of Thomas B. Landers Road and the relatively narrow footprint of both the shallow and deep lobes of the plume, continued assessment of plume migration in this area will be based on hydraulic and chemical monitoring data collected at a network of wells and piezometers in the vicinity of the leading edge of the plume rather than relying on groundwater flow and transport modeling.
- There is no current risk of exposure to the plume as a result of the revised plume delineation because residences in the immediate vicinity of the plume were connected to the public water supply system in 1997 by AFCEE. However, several residences located to the south of the current delineation of the uncaptured portion of the plume have been identified as potentially having private wells that supply potable water. AFCEE has contacted these residents and is currently arranging to have these wells sampled for those residents who requested sampling.

## 5.2 UNCERTAINTIES

The data evaluation presented in this technical memorandum has identified uncertainties associated with: (1) the western boundary of the plume north of the deep extraction well; (2) the northwestern boundary of the deep lobe of the uncaptured portion of the plume; (3) the southeastern boundary of the shallow lobe of the uncaptured portion of the plume;

and (4) the ability to predict the future migration of both the shallow and deep lobes of the uncaptured portion of the plume. As previously noted, the leading edge investigation is ongoing at the time of the preparation of this technical memorandum. It is anticipated that the data collected during the ongoing investigation will aid in addressing the uncertainties identified for the uncaptured portion of the plume. Actions to address the uncertainty associated with the western boundary of the plume upgradient of the deep extraction well are recommended in Section 5.3 below.

## **5.3 RECOMMENDATIONS**

### **5.3.1 Leading Edge Investigation**

The ongoing leading edge investigation has been designed to collect data to address the uncertainties discussed above associated with the characterization of the uncaptured portion of the plume. Specifically, drilling has either been completed or is planned in the following areas:

- To define the northwestern boundary of the uncaptured portion of the plume, groundwater profiling was completed and piezometers were installed during April 2006 at the location on Thomas B. Landers Road west of the Augusta Bog (designated 69PZ0023A,B/69MW0023). Since these data were collected concurrent with the preparation of this technical memorandum, these data were not included in this evaluation.
- Three hydraulic monitoring locations are being installed between Jenkins Pond and Pond 14. One location has been completed on Sandwich Road (designated 69MW0025A,B/69PZ0025) during April 2006 using sonic drilling and included groundwater vertical profiling, the collection of soil samples and the installation of monitor wells and a piezometer. A direct push location has also been completed on Pinecone Lane (designated 69PZ0024A,B) and included groundwater vertical profiling and the installation of piezometers. The third location south of Round Pond (on Round Pond Drive and designated 69PZ0026A,B) is yet to be completed at the time of preparation of this technical memorandum.
- A direct push location (designated 69DP0135) is planned at the intersection of Sandwich Road and John Parker Road to provide additional aquifer characterization data.
- The need for the proposed monitoring well at the Cape Cod Cooperative Campground will be determined following the evaluation of the hydraulic data collected from the uncaptured portion of the plume,

- Slug testing will be conducted in newly installed screens within and in the vicinity of the current leading edge of the uncaptured portion of the plume to provide estimates of aquifer hydraulic conductivity at locations south of Thomas B. Landers Road. The locations for the slug testing will be determined following the completion of the ongoing investigations and after evaluation of hydraulic data collected from the new piezometers.

The proposed drilling locations are shown on [Figure 5-1](#). Data collected at these locations will be (or have been) presented during technical update meetings.

### **5.3.2 Hydraulic Monitoring**

Recommendations related to hydraulic monitoring are as follows:

- The SPEIM hydraulic monitoring network should be optimized in light of the new characterization data presented in this technical memorandum. The new FS-28 SPEIM hydraulic network will be presented in a project note. The objective of the network optimization will be to select hydraulic monitoring locations that will provide data necessary to:
  - 1) Evaluate the flow field that is influenced by the operation of the FS-28 ETD system using the residual analysis method (AFCEE 2004c). This evaluation will be used to verify the existing FS-28 groundwater model-predicted capture of the EDB plume by the deep extraction well and the SWP system.
  - 2) Assess the groundwater flow field that influences the migration of the uncaptured portion of the FS-28 plume (i.e., south of the influence of the FS-28 ETD system). As noted in the conclusions presented in Section 5.1, the fate of the uncaptured portion of the plume should be assessed using measured data rather than relying on groundwater modeling due to indications that the groundwater flow field in this area is complex. The network of wells and piezometers in this area is currently being improved as described in Section 5.3.1.
- Upon completion of the drilling at the leading edge of the plume and the redesign of the hydraulic monitoring network, a synoptic groundwater level survey is recommended to provide a comprehensive dataset that can be used to evaluate the flowfield within both the captured and uncaptured portions of the plume.

### **5.3.3 Chemical Monitoring**

The proposed SPEIM groundwater chemical monitoring network is presented in [Table 5-1](#) and locations are shown on [Figure 5-2](#). Specifically, the following changes will be incorporated in the SPEIM groundwater monitoring program:

- Monitoring well 69MW1316 will be sampled for EDB once every two years using a diffusion sampler to monitor the western boundary of the plume upgradient of the deep extraction well.
- Monitoring wells located outside of the plume boundary of the northern plume lobe will be sampled for EDB once every two years using diffusion samplers, with the exception 69MW1501. The monitoring frequency for 69MW1501, an irrigation well sentry well, is proposed to be reduced from monthly during the growing season (March through October) to four times during the growing season April, June, August and October, contingent based on concurrence by the property owner.
- Monitoring wells located within the northern lobe of the plume and north of the western arm of Coonamessett Pond will be sampled for EDB once every two years using diffusion samplers.
- Monitoring wells located within the northern lobe of the plume and south of the western arm of Coonamessett Pond will be sampled for EDB annually using diffusion samplers, with the exception of CWSW sentry wells 69MW1279B and 69MW1279C which will be sampled quarterly for EDB analysis.
- Monitoring wells 69MW1419 and 69MW1271 will be eliminated from the SPEIM program because the plume has migrated south of these locations and the trailing edge of the plume is currently monitored at 69MW1272 and 69MW1416.
- Piezometers 69PZ0005B, 69PZ0019B, 69PZ1298A, 69PZ1300A, 69PZ1302A, and 69PZ1308A will be sampled semiannually for EDB analysis to monitor the shallow lobe of the uncaptured portion of the plume.
- Piezometer 69PZ0017A and monitoring wells 69MW0012A, 69MW0023, and 69MW0025A,B will be sampled semiannually for EDB analysis to monitor the deep lobe of the uncaptured portion of the plume.

Because the CWSW has been connected to the Crooked Pond water treatment plant, the well will no longer be sampled for EDB and the Town of Falmouth agreed to reduce the monitoring frequency for the two upgradient sentry wells (69MW1279B,C) from monthly to quarterly.

The proposed SPEIM surface water monitoring network is presented in [Table 5-2](#) and locations are shown on [Figure 5-3](#). Recommended changes are as follows:

- The existing 20 surface water locations included in the chemical monitoring network north of Sandwich Road ([Figure 5-3](#)) will be monitored monthly during the cranberry growing season (March through October). Most of these locations are currently monitored monthly, however two locations (69SW0049 and 69SW2007) have been monitored less frequently (i.e., quarterly or annually) in the past. Monitoring

frequency will be increased to monthly between March and October at these locations.

- The following four surface water locations south of Pond 14 will be added to the SPEIM program and will be sampled for EDB annually in September prior to the cranberry harvest: 69SW0051, 69SW0052, 69SW2008, and 69SW2009.
- Surface water location 69SW0065 (located downstream of bubbler #1) will continue to be monitored for water quality parameters on a quarterly frequency. This location is monitored to assess the potential ecological impacts associated with the discharge of treated water to the Coonamessett River from the ETD system.

Surface water samples will continue to be collected for EDB analysis near recreational beaches at Coonamessett Pond, Deep Pond, Jenkins Pond and Round Pond during April/May and July.

#### **5.3.4 Residential Well Sampling**

One residence located approximately 600 feet south of the shallow lobe, and several residences located approximately 1,600 feet south of the current leading edge of deep lobe, may have private wells that supply potable water. These residents have been contacted by AFCEE and sampling of these private wells for EDB is underway for those residents who requested sampling. AFCEE plans to add these locations to the residential well monitoring program.

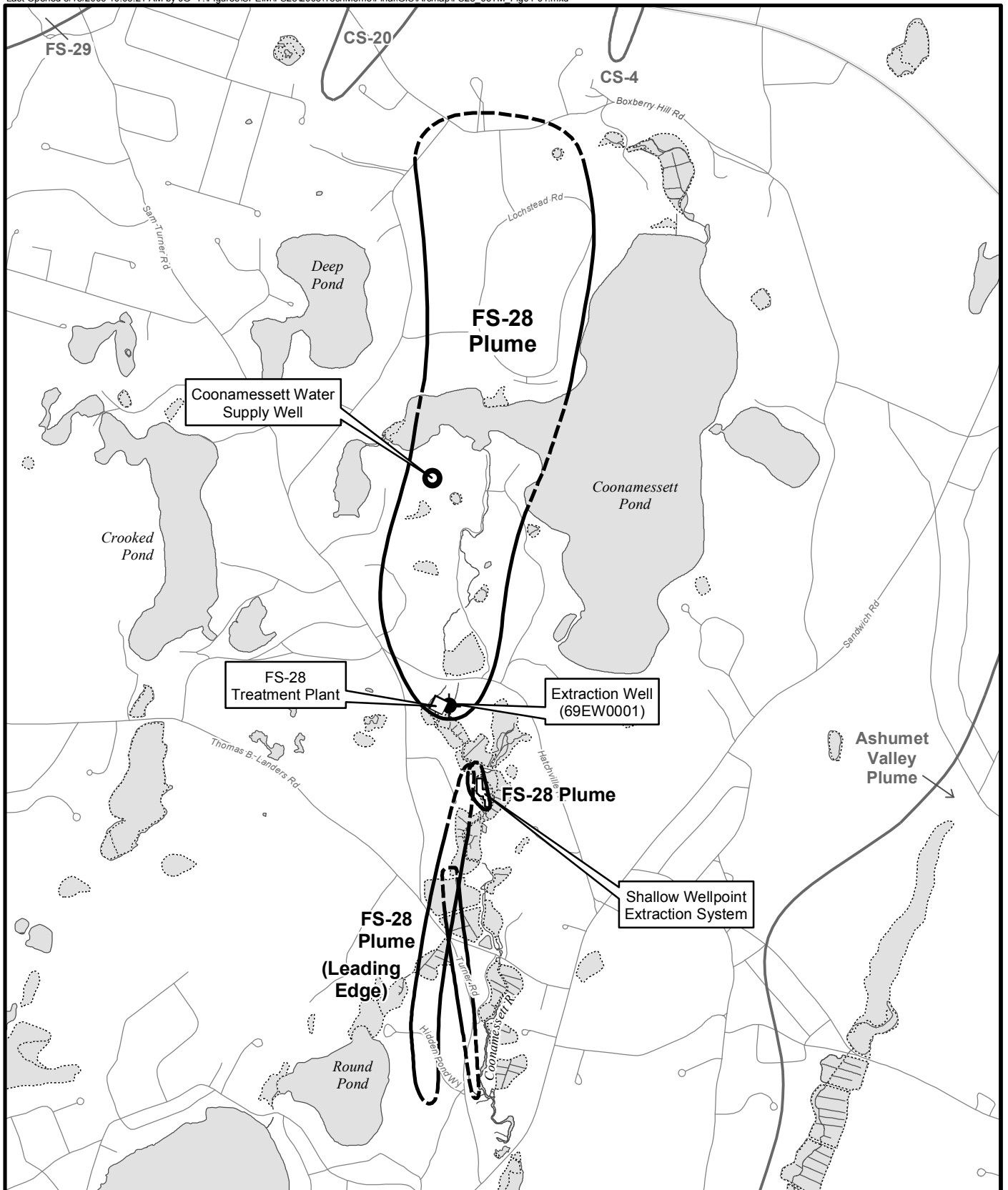
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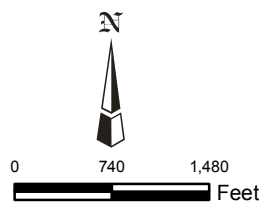
Golden Software, Inc . Surfer 8® Contouring and 3D Surface Mapping for Scientists and Engineers. Golden Colorado 80401-1866.



### Legend

- Extraction Well
- Public Water Supply Well
- Treatment Plant
- Bog/Wetland
- FS-28 Plume Boundary (Dashed Where Inferred)
- Other Plume Boundary (Dashed Where Inferred)

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

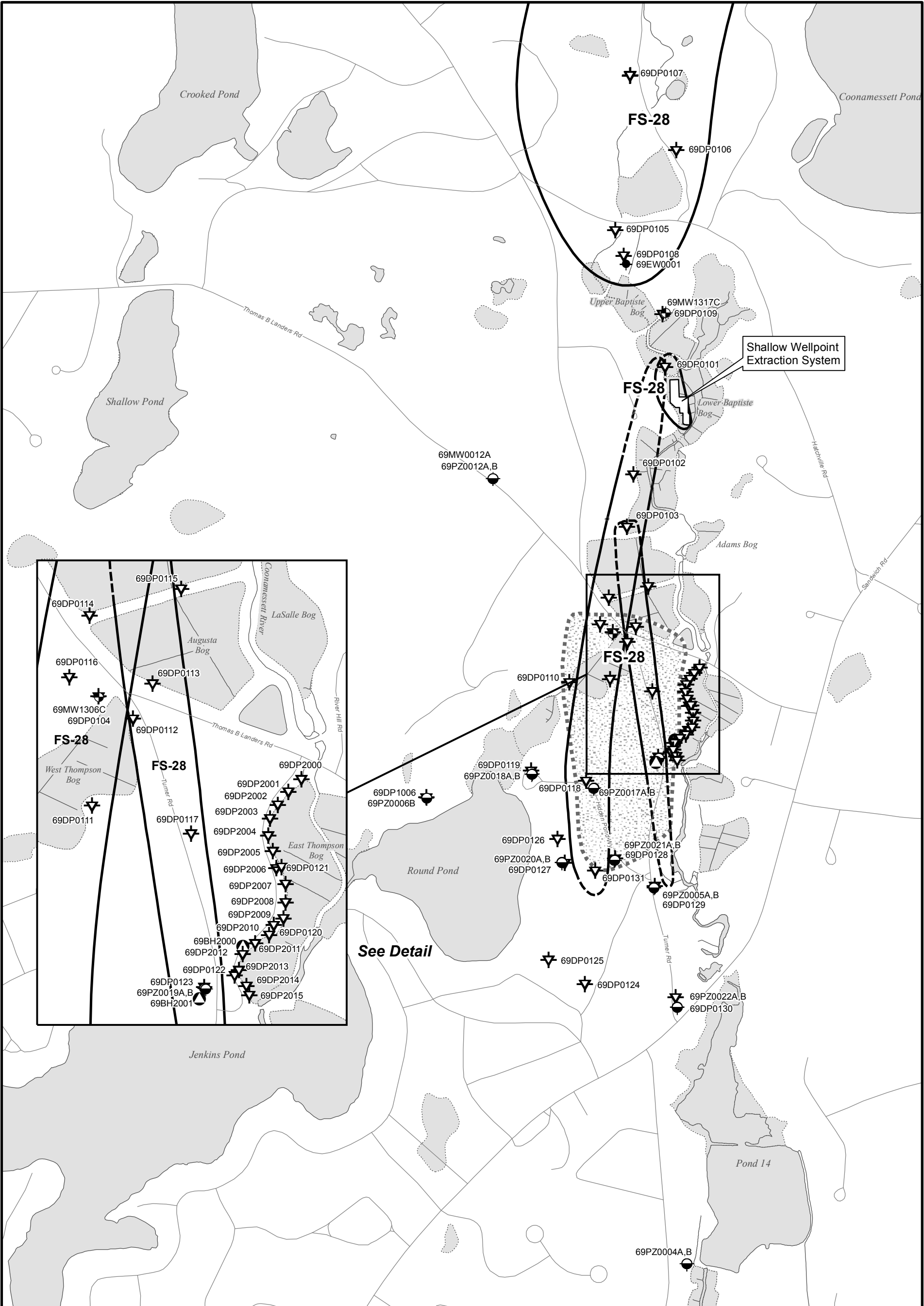


### FIGURE 1-1

#### FS-28 PLUME AND TREATMENT SYSTEM

AFCEE - Massachusetts Military Reservation  
Final FS-28 2005 Plume Update Technical Memorandum

**CH2MHILL**



Legend

- |  |                       |  |   |
|--|-----------------------|--|---|
|  | *Direct Push Location |  | Soil Boring                               |
|  | Monitoring Well       |  | Shallow Wellpoints                        |
|  | Piezometer            |  | Plume Boundary<br>(Dashed Where Inferred) |
|  | Extraction Well       |  |   |

\*69DP2000 - 69DP2015 are hand-driven pushpoint sample locations.

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

- |  |  |
|--|--|
|  | Approximate Limit of<br>Inferred/Observed Silty Sand<br>Unit |
|  | Bog/Wetland  |

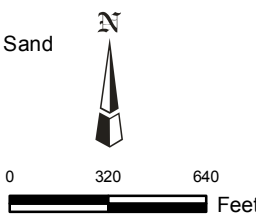


FIGURE 2-1

FS-28 DRILLING LOCATIONS

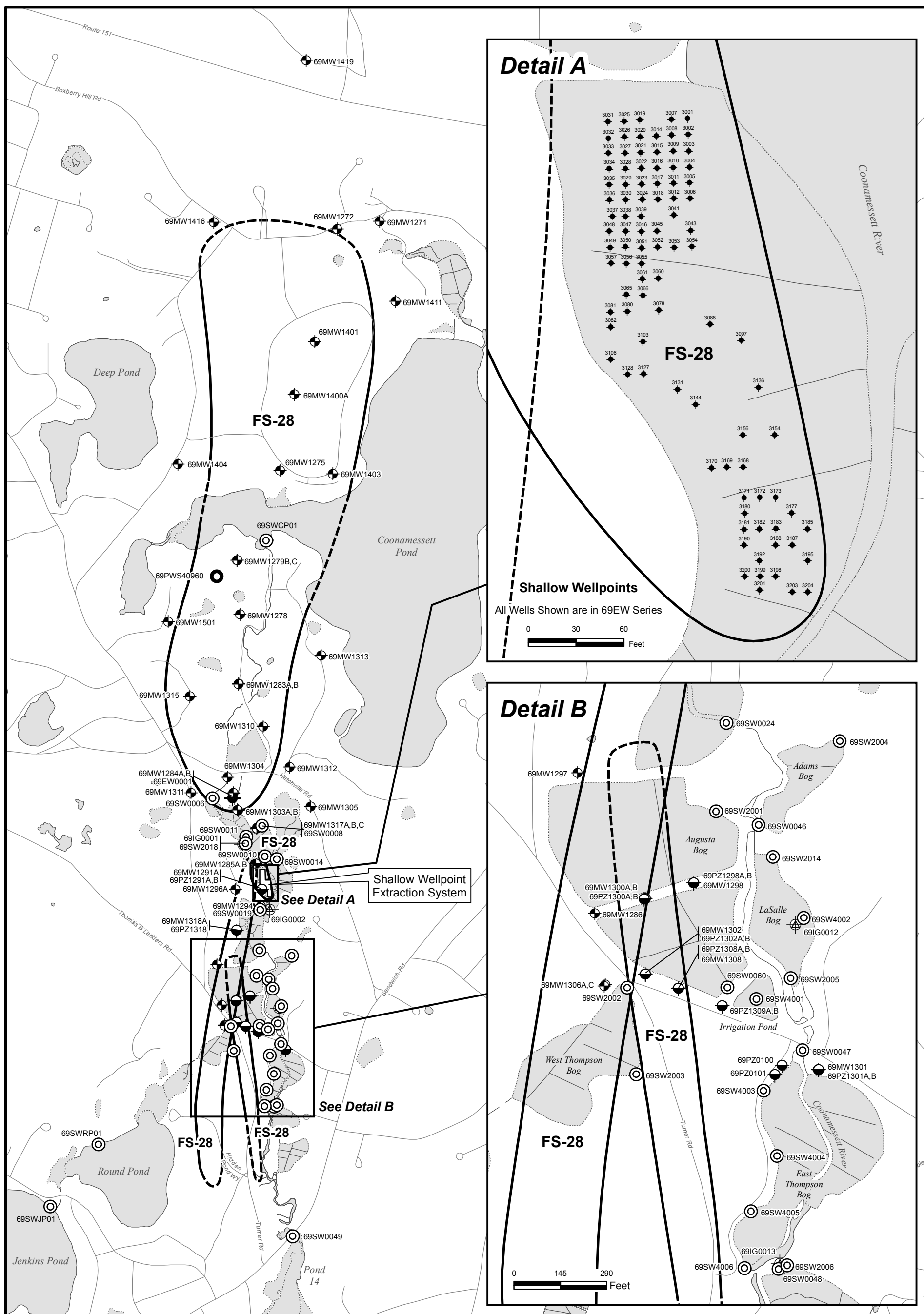
AFCEE - Massachusetts Military Reservation  
Final FS-28 2005 Plume Update Technical Memorandum

### FIGURE 2-2

## FS-28 GROUNDWATER HYDRAULIC MONITORING LOCATIONS

AFCEE - Massachusetts Military Reservation  
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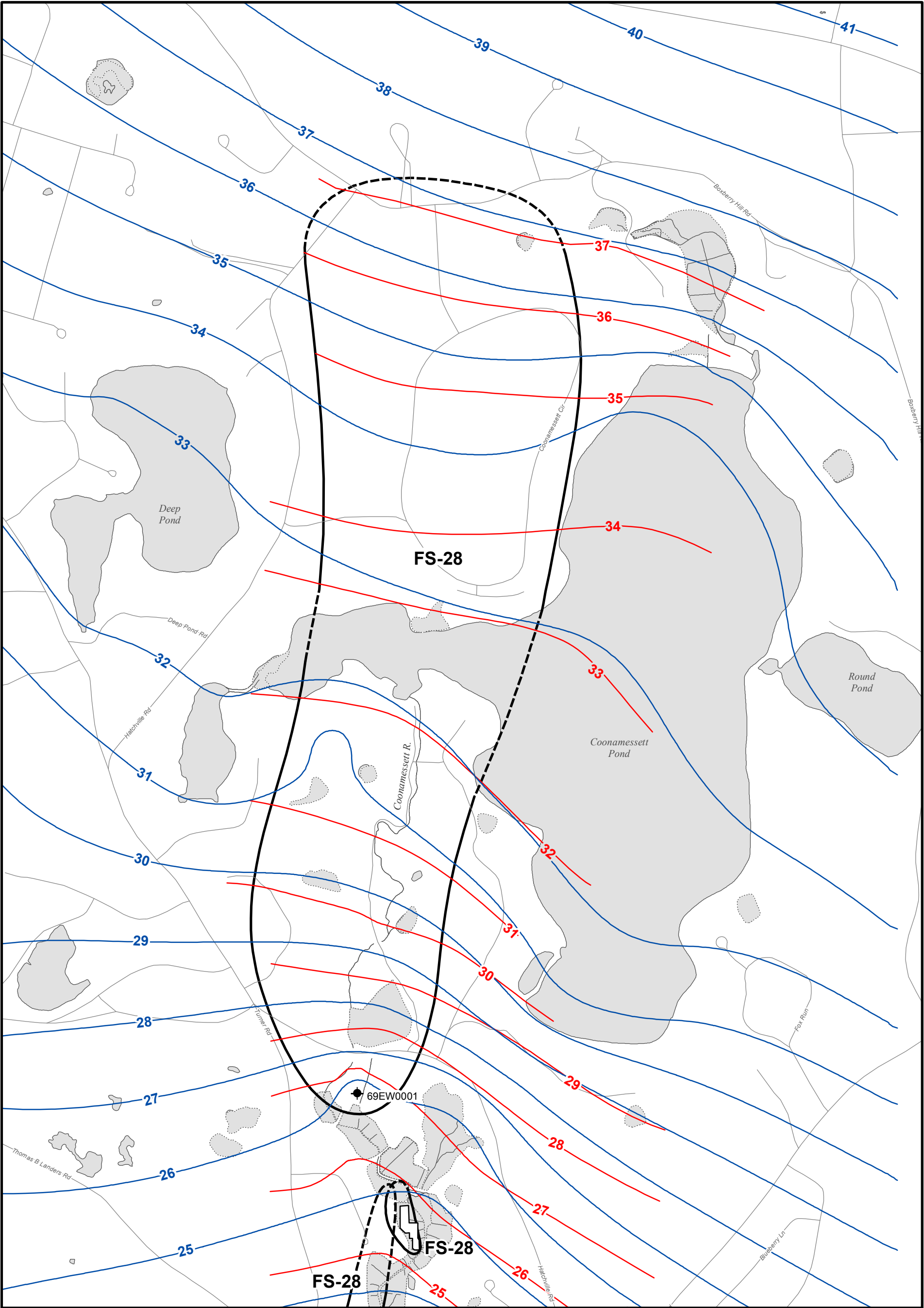
Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

### FIGURE 2-3

## FS-28 CHEMICAL MONITORING LOCATIONS

AFCEE - Massachusetts Military Reservation  
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Legend

- Plume Boundary (Dashed Where Inferred)
- Model-predicted Groundwater Contours (1 ft Interval)<sup>(1)</sup>
- Groundwater Contours Based on Groundwater Elevations Measured on 27 October 2004

- Extraction Well
- Bog/Wetland
- Shallow Wellpoints

(1) Model-predicted groundwater contours are from Layer 18 of the 2002 FS-28 groundwater model using design pumping rates of 550 gpm at 69EW0001 and 200 gpm at shallow wellpoints.

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

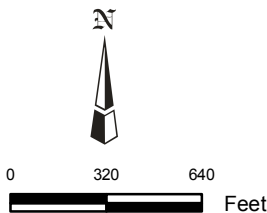
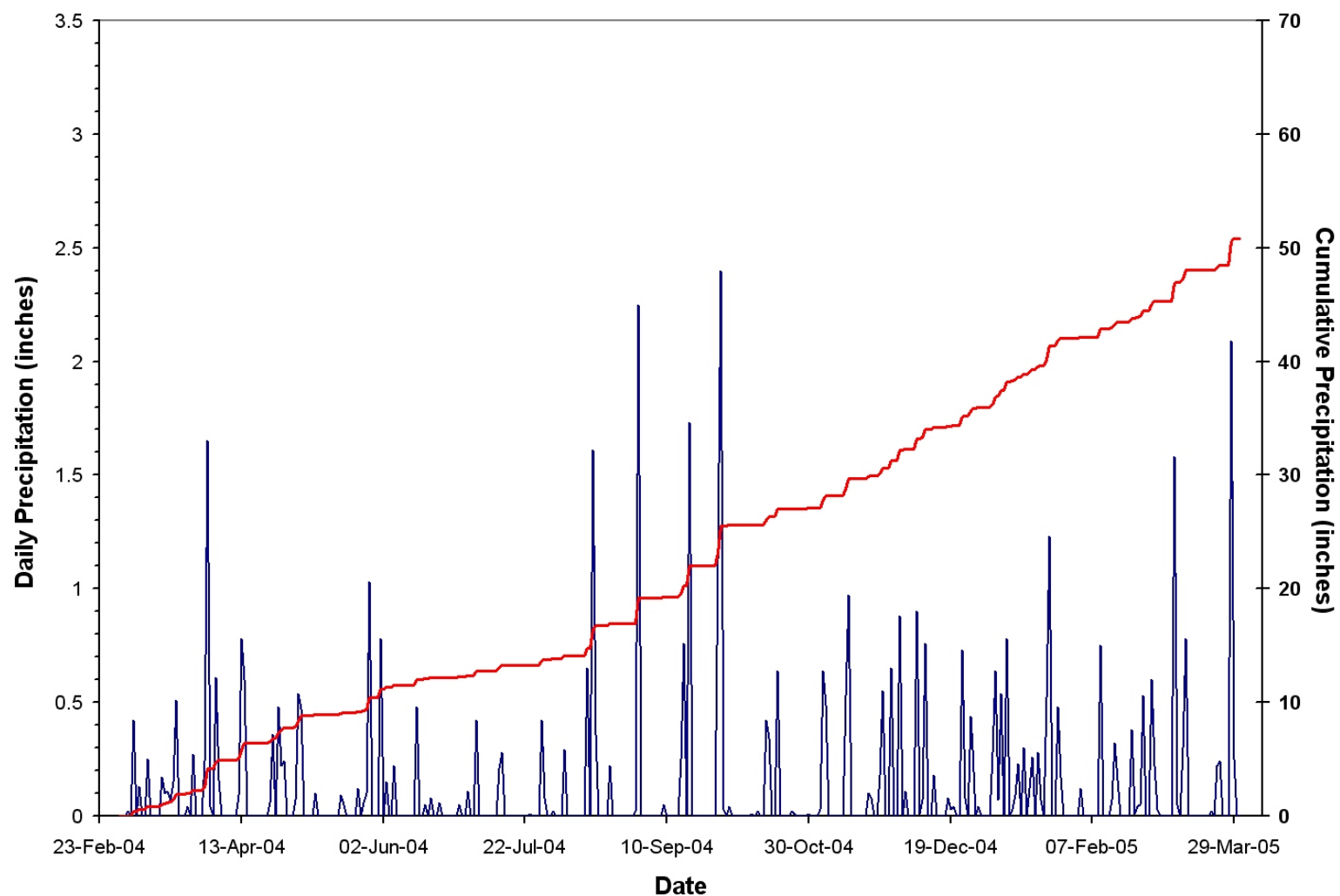


FIGURE 3-1

GROUNDWATER CONTOURS  
NORTH OF FS-28 ETD SYSTEM

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Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

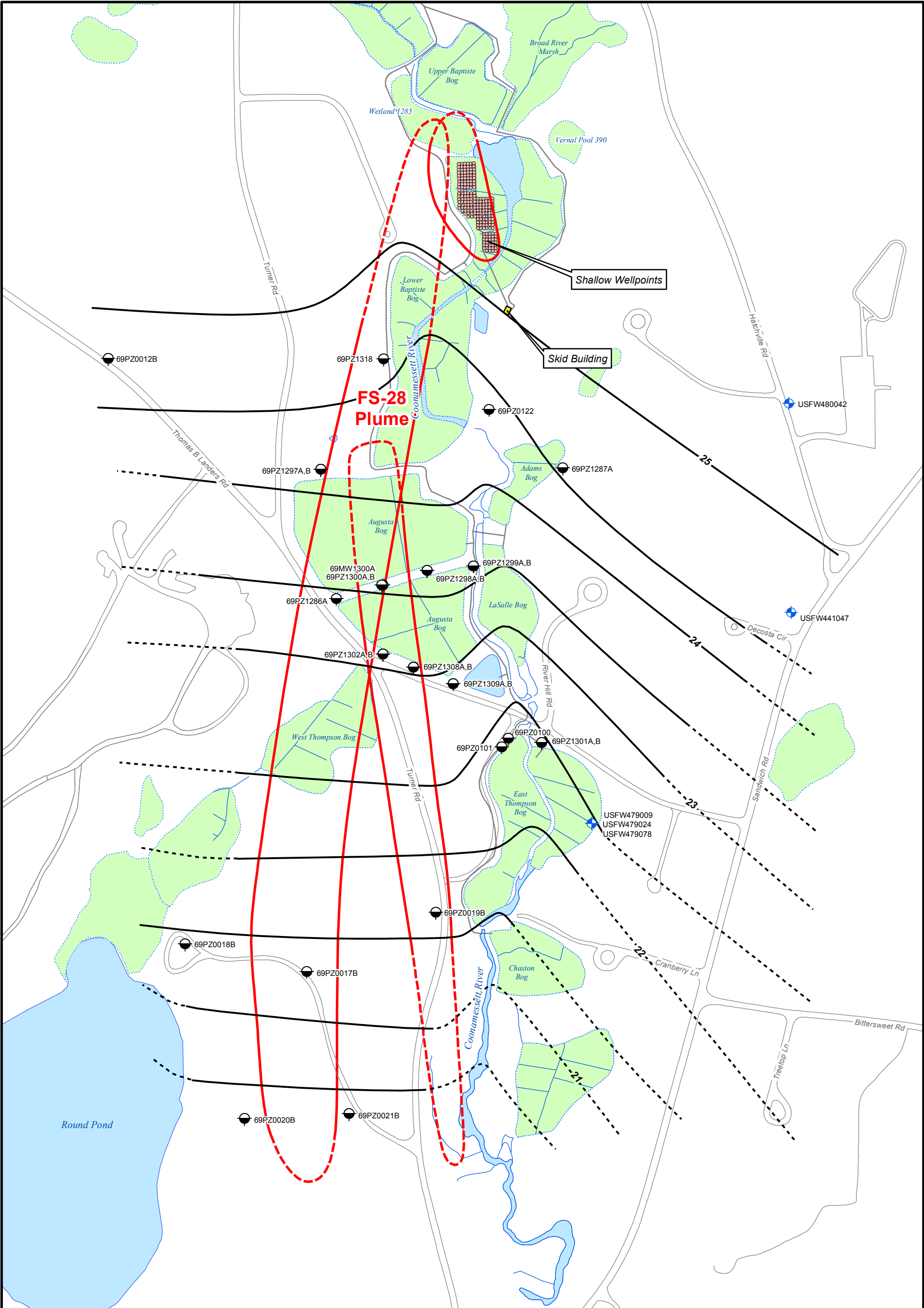
#### Legend

- Total Daily Precipitation
- Cumulative Daily Precipitation

#### FIGURE 3-2

#### PRECIPITATION BETWEEN MARCH 2004 AND MARCH 2005

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Memorandum



Legend

- Bog/Wetland
- Plume Boundary (Dashed Where Inferred)
- Monitoring Well
- Piezometer
- Shallow Extraction Wellpoint

- Treatment System Piping
- Shallow Groundwater Contour (ft msl) (Dashed Where Inferred)

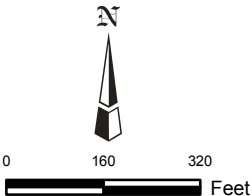
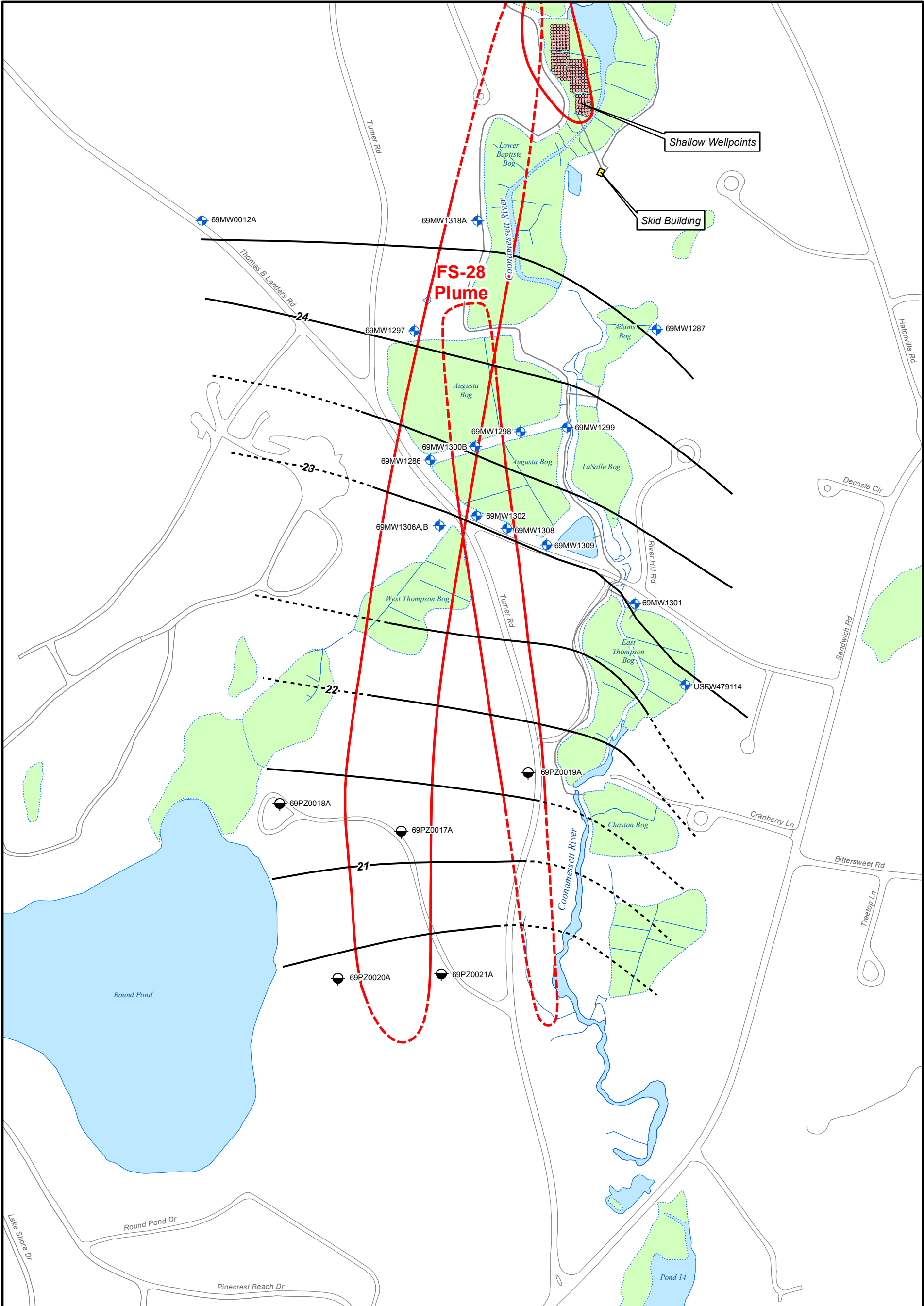


FIGURE 3-3

FS-28 SHALLOW GROUNDWATER CONTOUR MAP - NOVEMBER 2005

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Final FS-28 2005 Plume Update Technical Memorandum





Legend

- Bog/Wetland
- Plume Boundary (Dashed Where Inferred)
- Monitoring Well
- Piezometer
- Shallow Extraction Wellpoint

- Treatment System Piping
- Deep Groundwater Contour (ft msl) (Dashed Where Inferred)

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

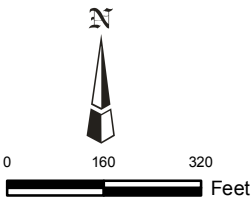
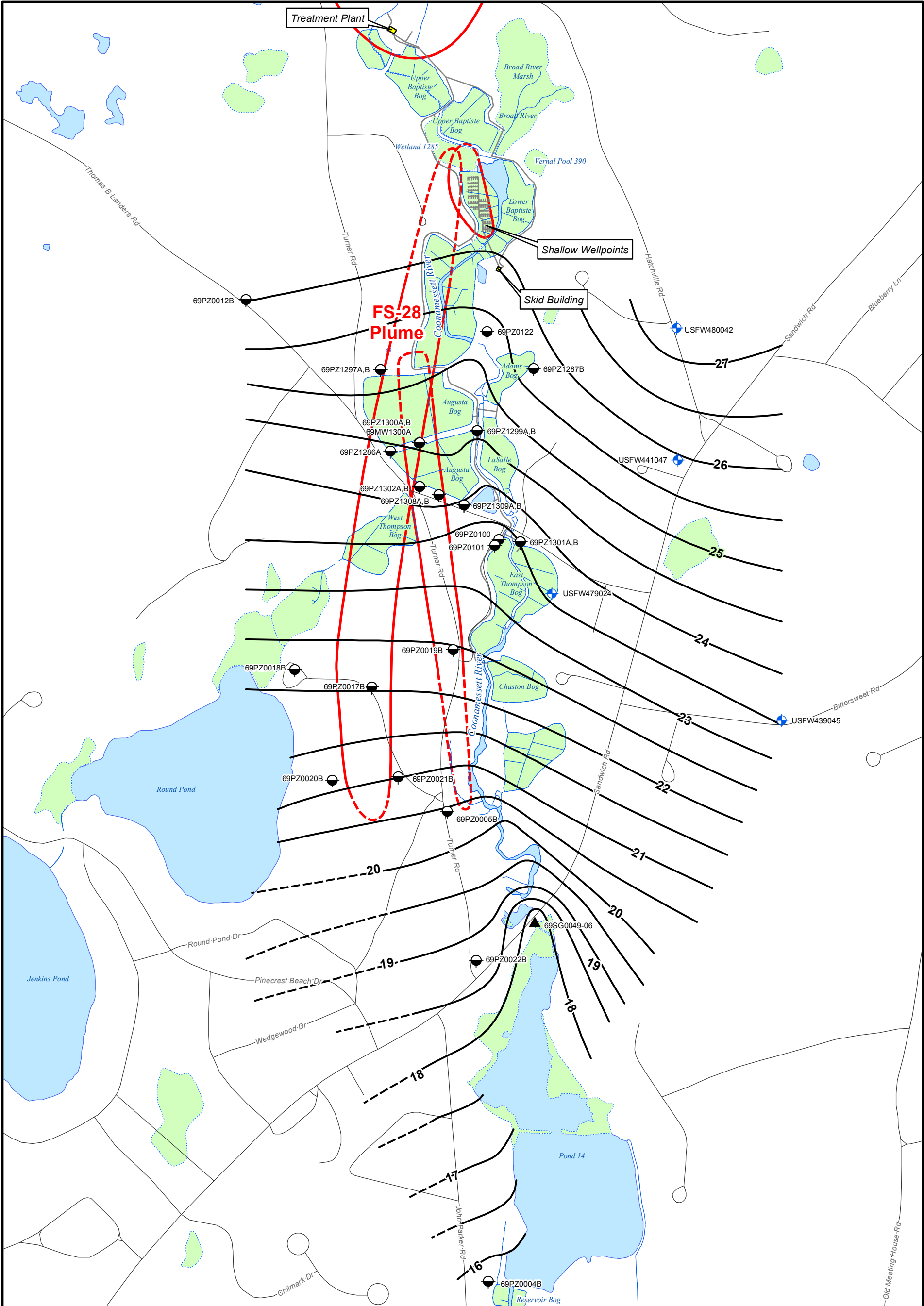


FIGURE 3-4

FS-28 DEEP GROUNDWATER CONTOUR MAP - NOVEMBER 2005

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Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

Legend



Bog/Wetland



Plume Boundary  
(Dashed Where Inferred)



Treatment System Piping



Shallow Groundwater Contour (ft msl)  
(Dashed Where Inferred)



Monitoring Well



Piezometer



Shallow Extraction Wellpoint



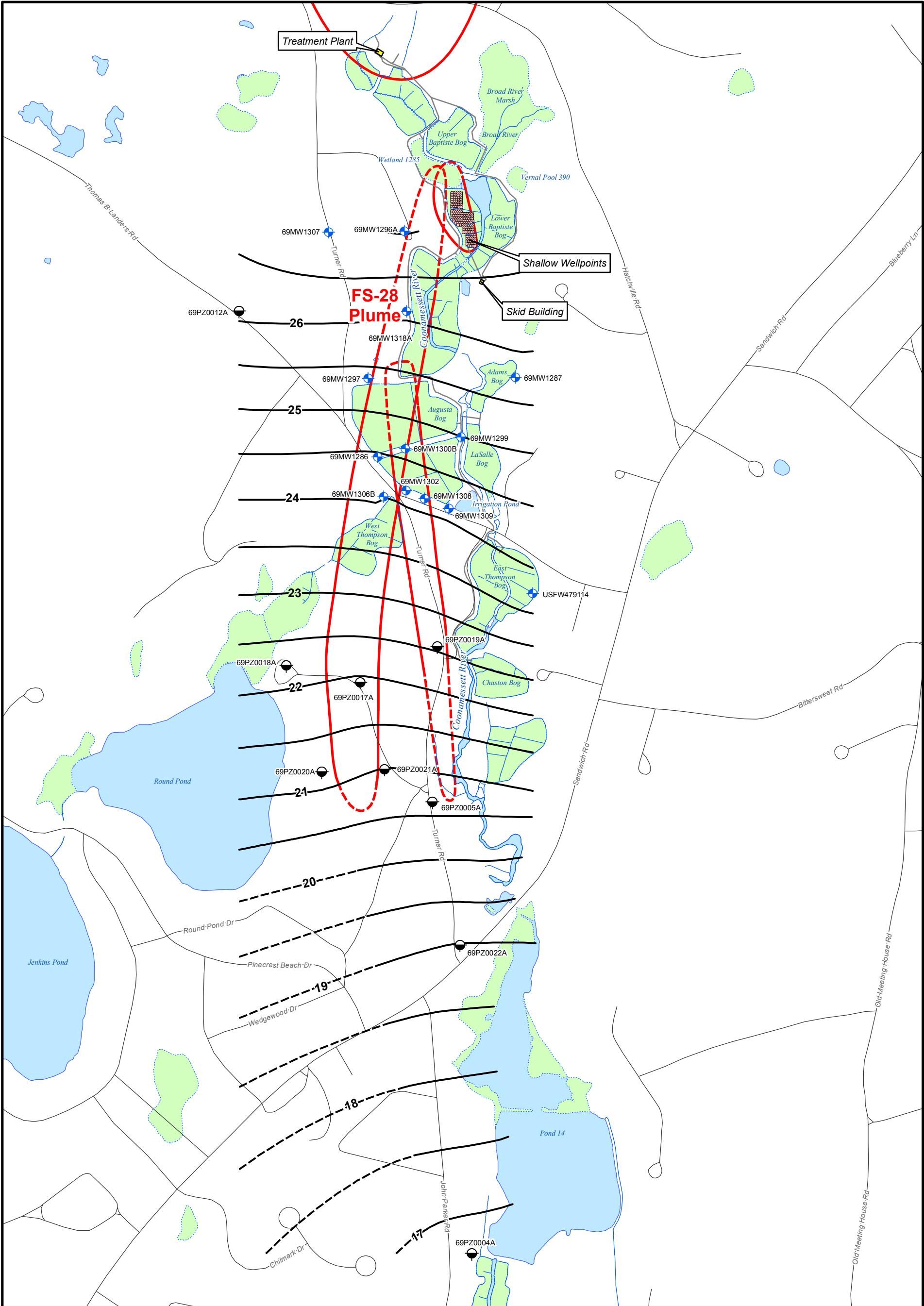
0 250 500  
Feet

FIGURE 3-5








FS-28 SHALLOW GROUNDWATER  
CONTOUR MAP- MARCH 2006

AFCEE - Massachusetts Military Reservation  
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Legend

- |   |  |   |                              |
|---|--|---|------------------------------|
|  | Bog/Wetland  |  | Monitoring Well              |
|  | Plume Boundary   |  | Piezometer                   |
|  | Treatment System Piping                                      |  | Shallow Extraction Wellpoint |
|  | Deep Groundwater Contour (ft msl)<br>(Dashed Where Inferred) |   |                              |

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

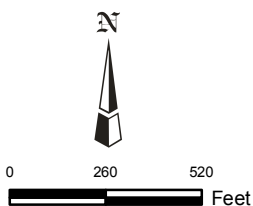


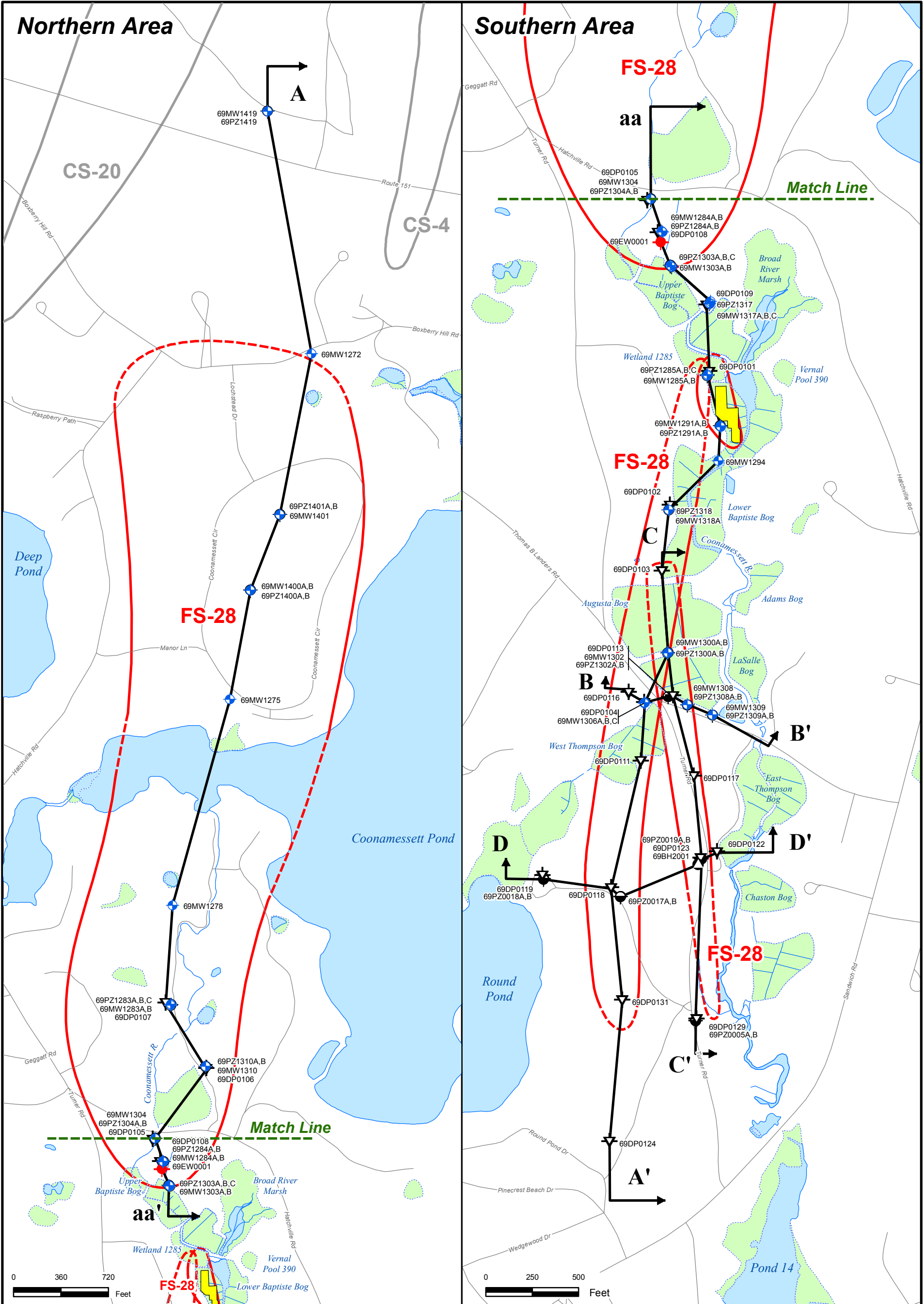
FIGURE 3-6

FS-28 DEEP GROUNDWATER  
CONTOUR MAP- MARCH 2006

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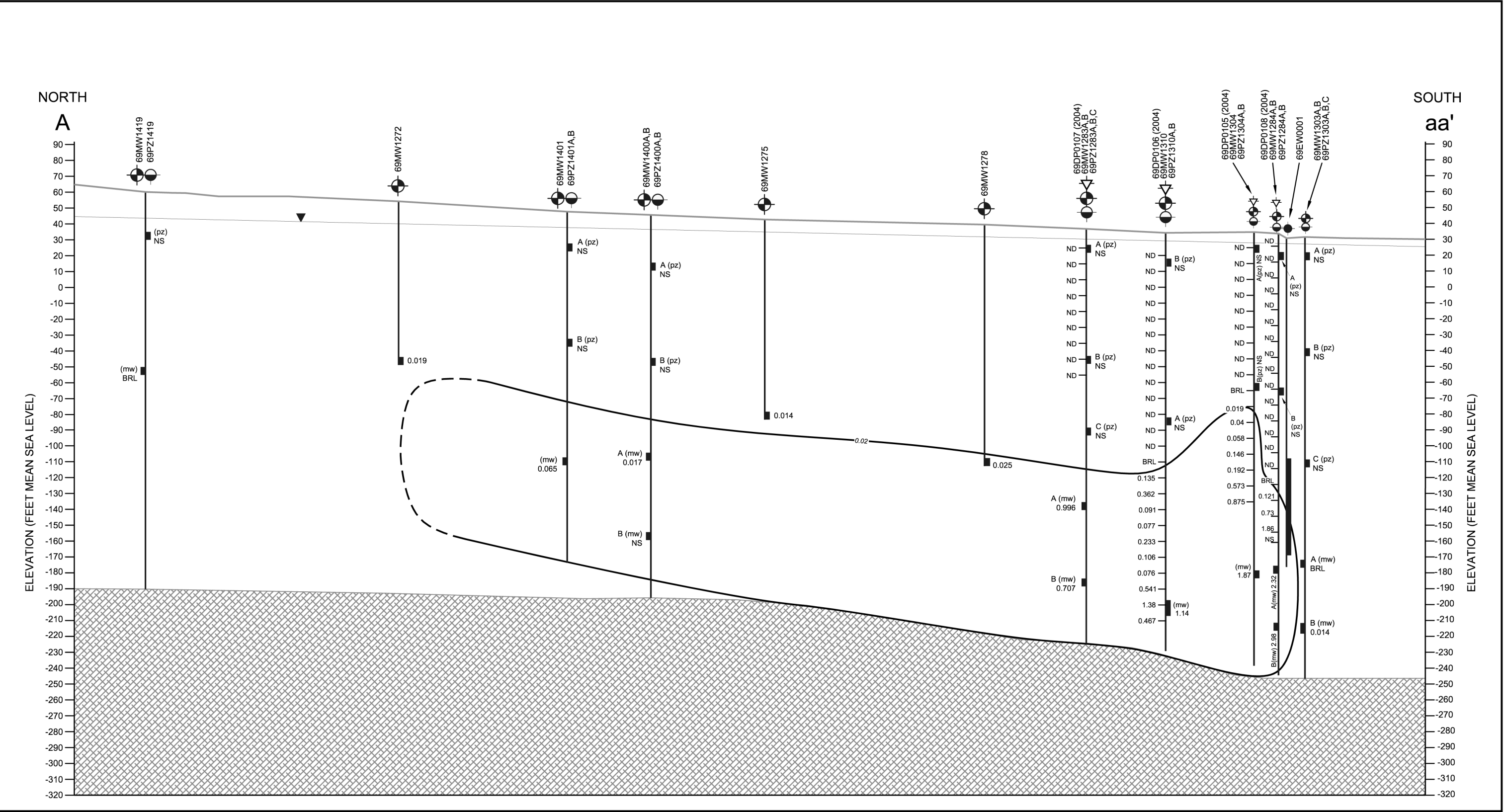
Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

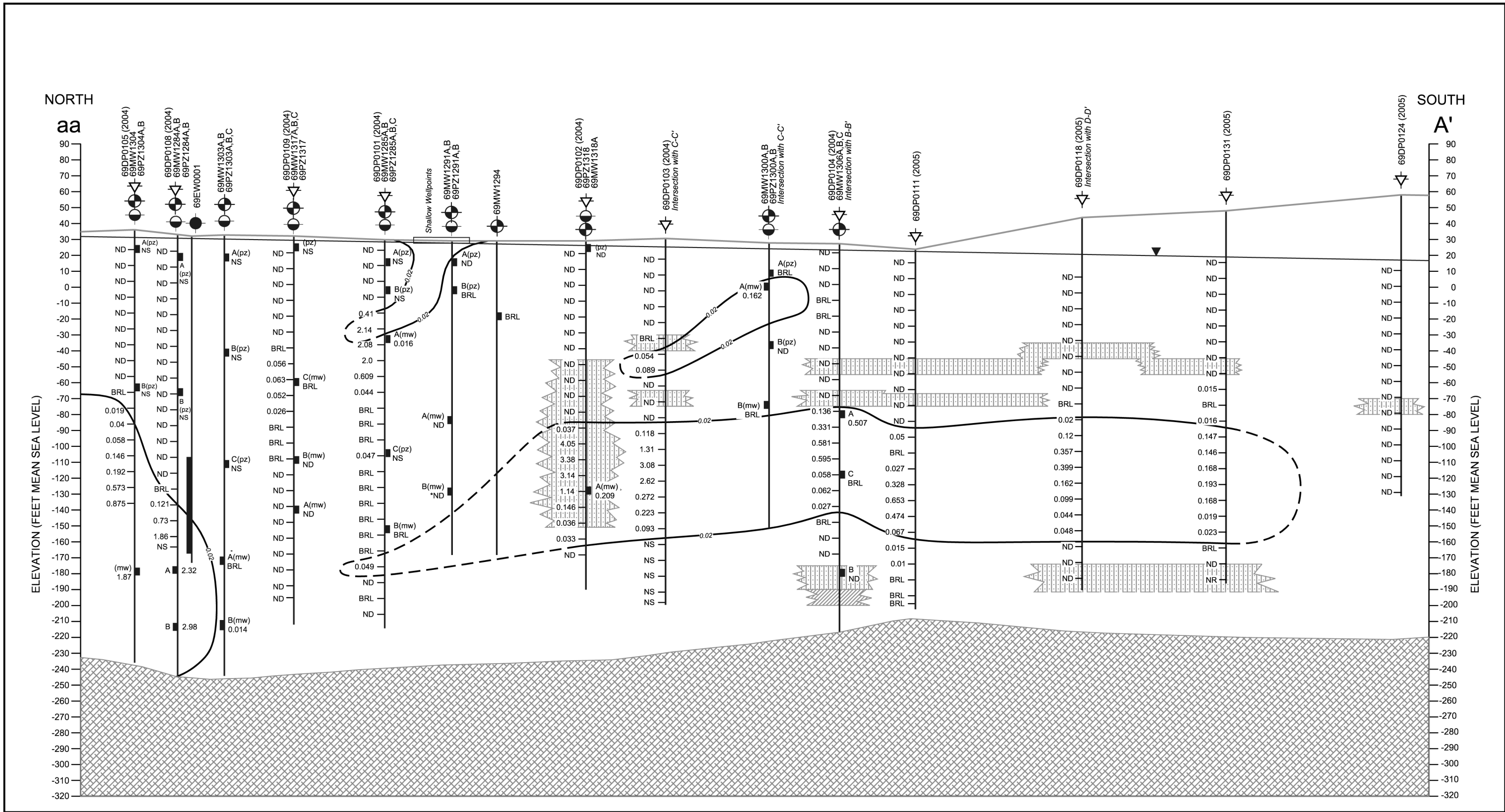
FIGURE 3-7

**FS-28 EDB PLUME AND LOCATION OF CROSS-SECTION LINES**

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NOTES: 1. Lithology at direct push locations is inferred from purge water observations. Monitoring well and piezometer data are from September 2005 sampling event. Date of direct push screening data is noted on figure.

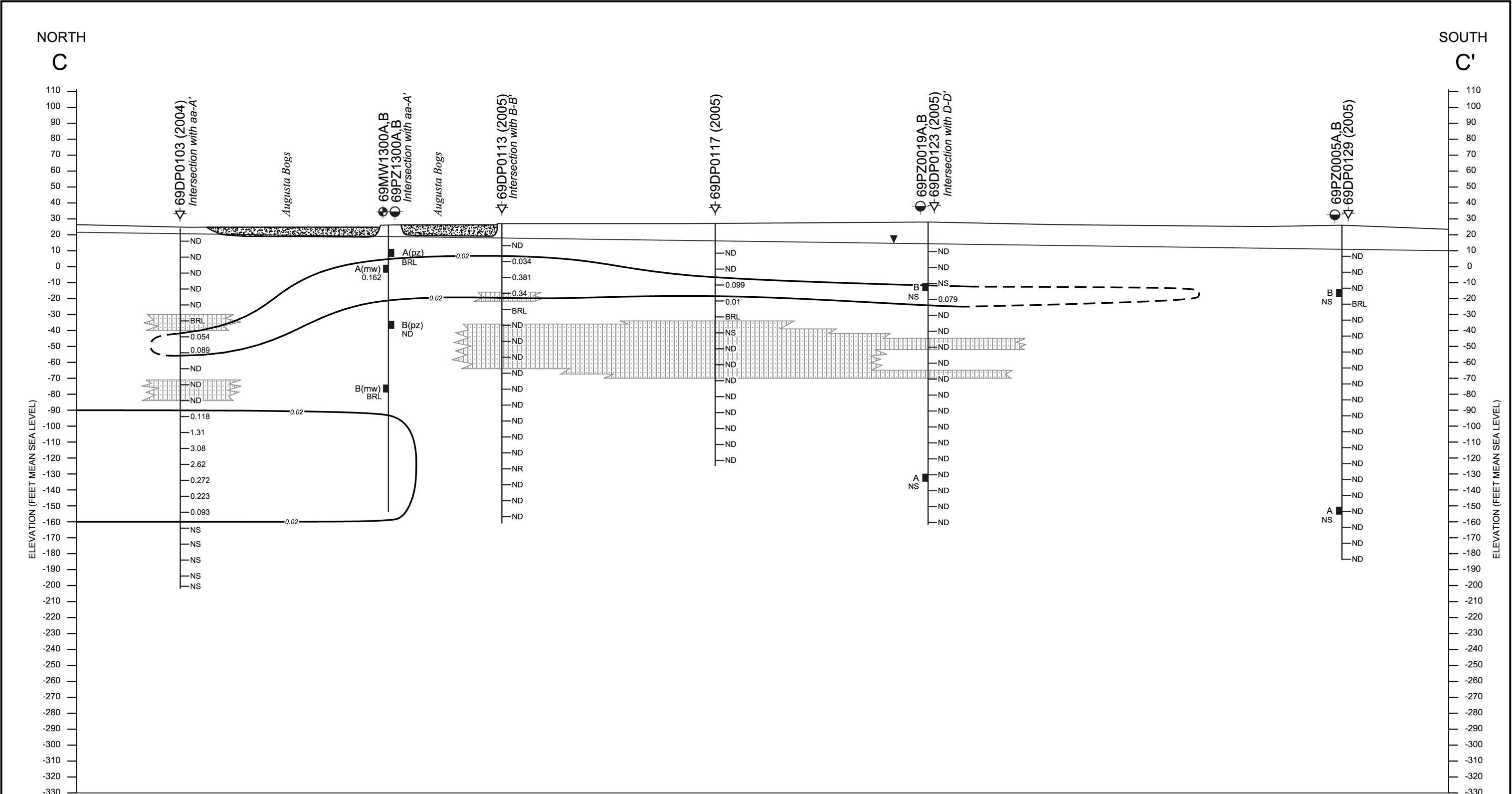
2. Sample not representative of groundwater adjacent to screen.

*\*Data from Final FS-28 2004 Annual System Performance and Ecological Impact Monitoring Report, December 2004*

0 V: 60  
H: 400  
 Feet

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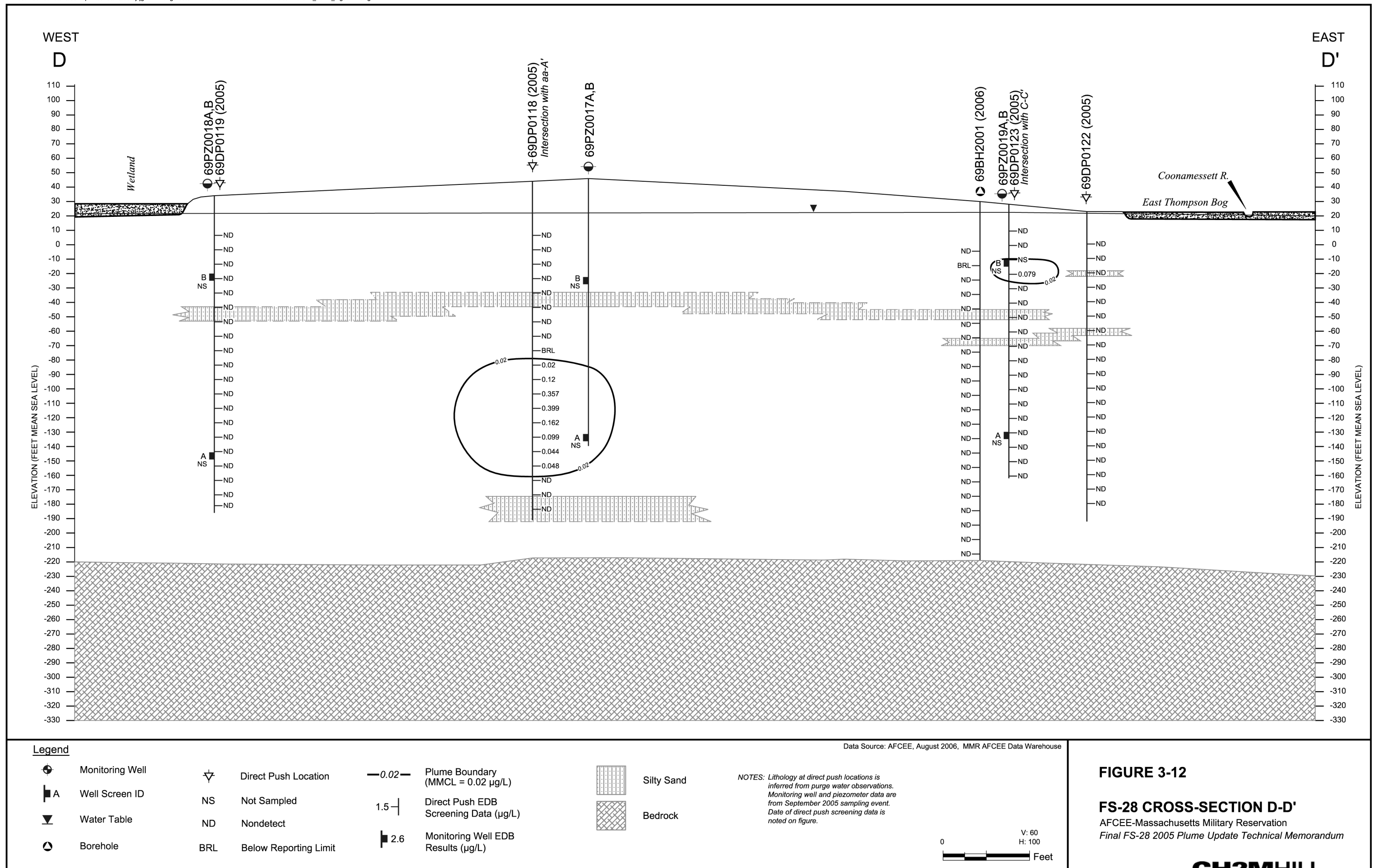


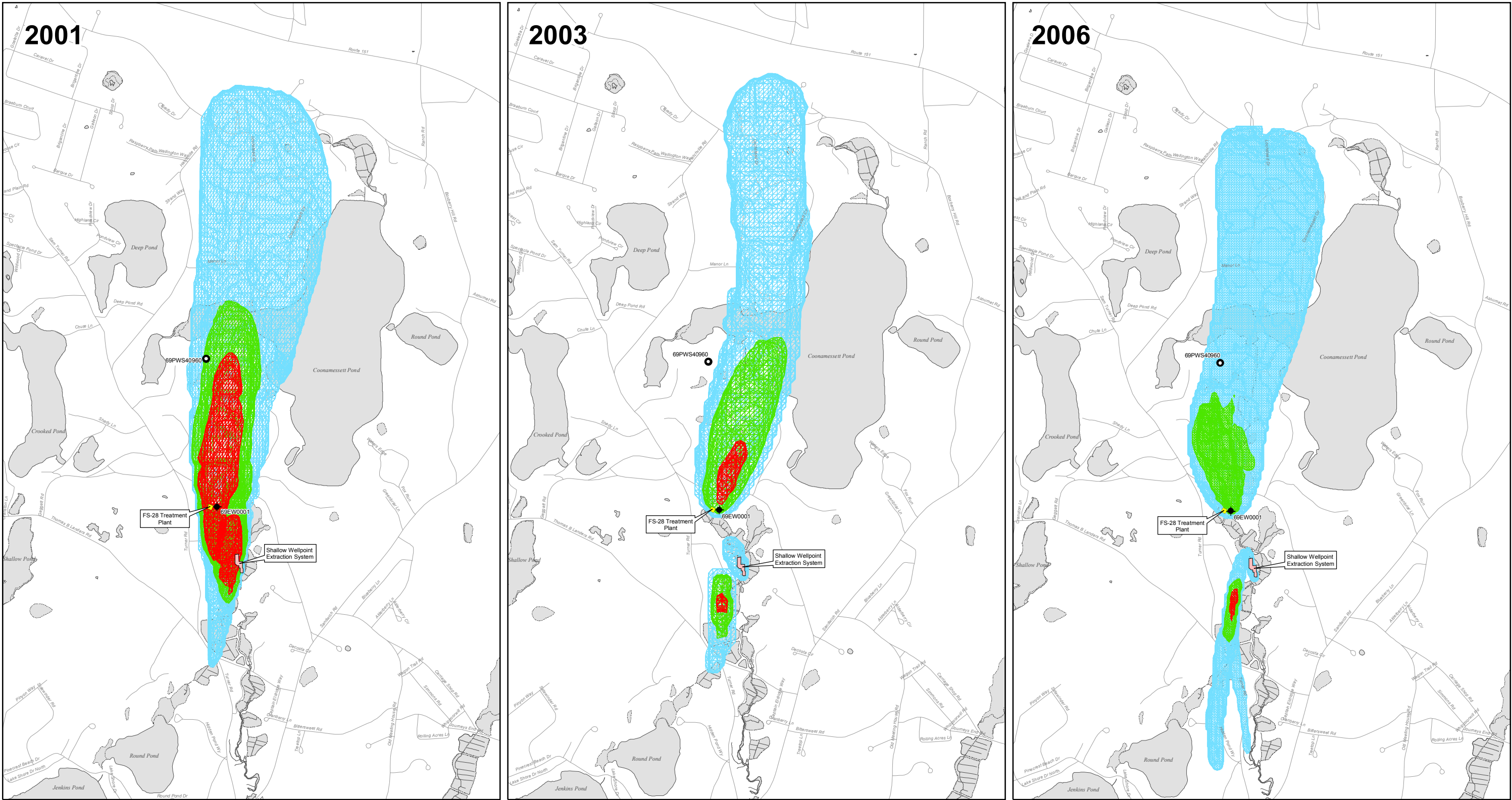


Data Source: AFCEE, August 2006, MMR AFCEE Data Warehouse









**Legend**

- Extraction Well
- Public Water Supply Well
- Treatment Facility
- Shallow Wellpoint Extraction System

**EDB Concentration**

- 0.02 µg/L ≤ EDB < 1.0 µg/L
- 1.0 µg/L ≤ EDB < 3.0 µg/L
- 3.0 µg/L ≤ EDB

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

0 810 1,620 Feet

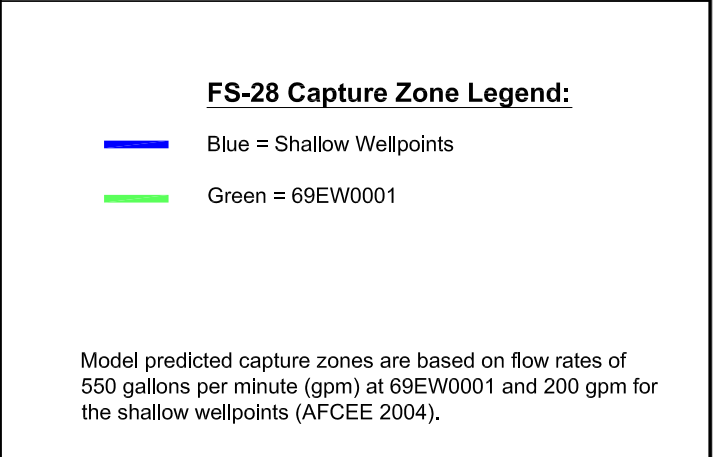
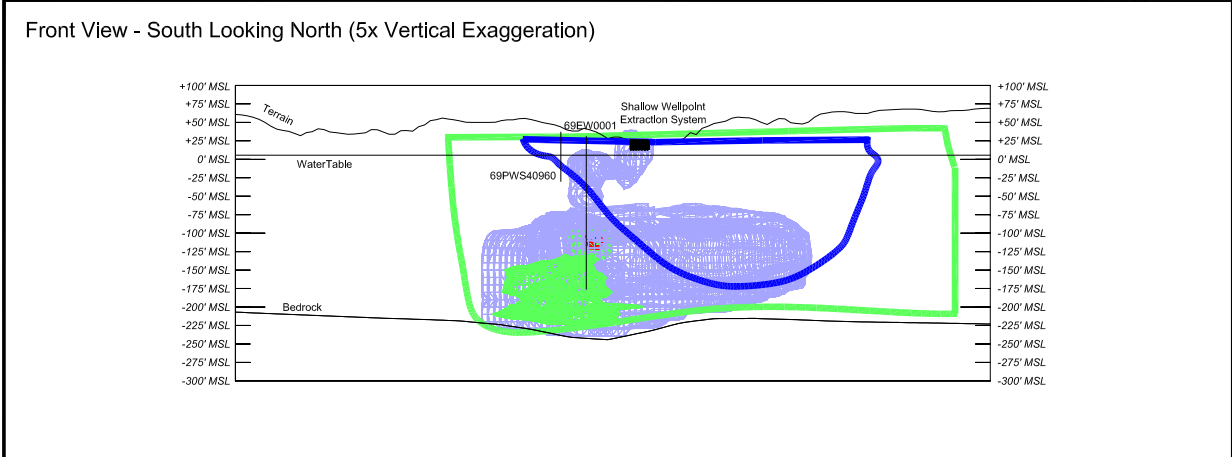
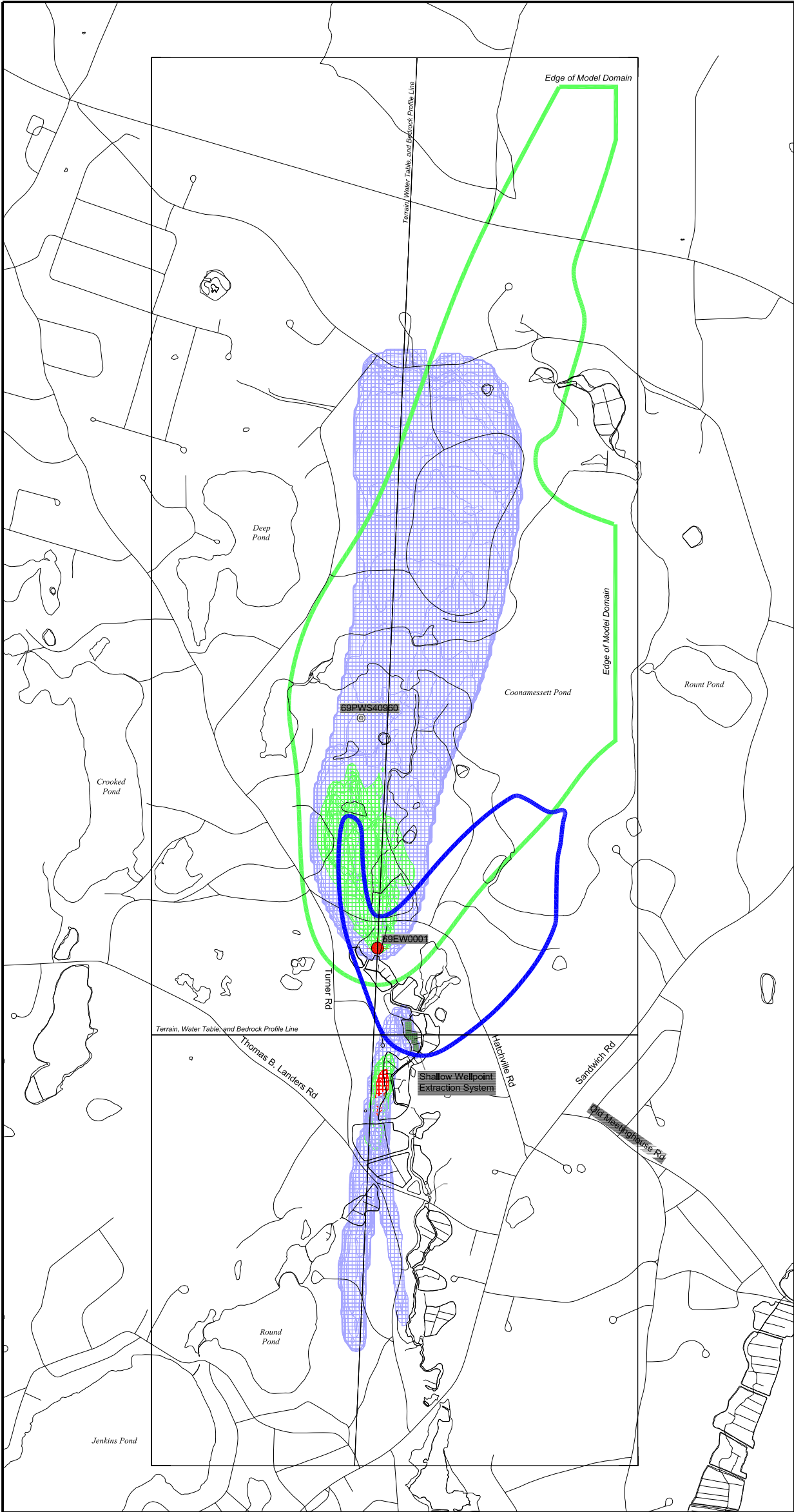
**FIGURE 3-13**

**FS-28 2001, 2003 AND 2006 EDB PLUME SHELLS**

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**Legend**

- Extraction Well
- Public Water Supply Well

**2006 Plume Shell EDB Concentrations:**

- $0.02 \mu\text{g/L} \leq \text{EDB} \leq 1.0 \mu\text{g/L}$
- $1.0 \mu\text{g/L} \leq \text{EDB} \leq 3.0 \mu\text{g/L}$
- $3.0 \mu\text{g/L} \leq \text{EDB}$

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

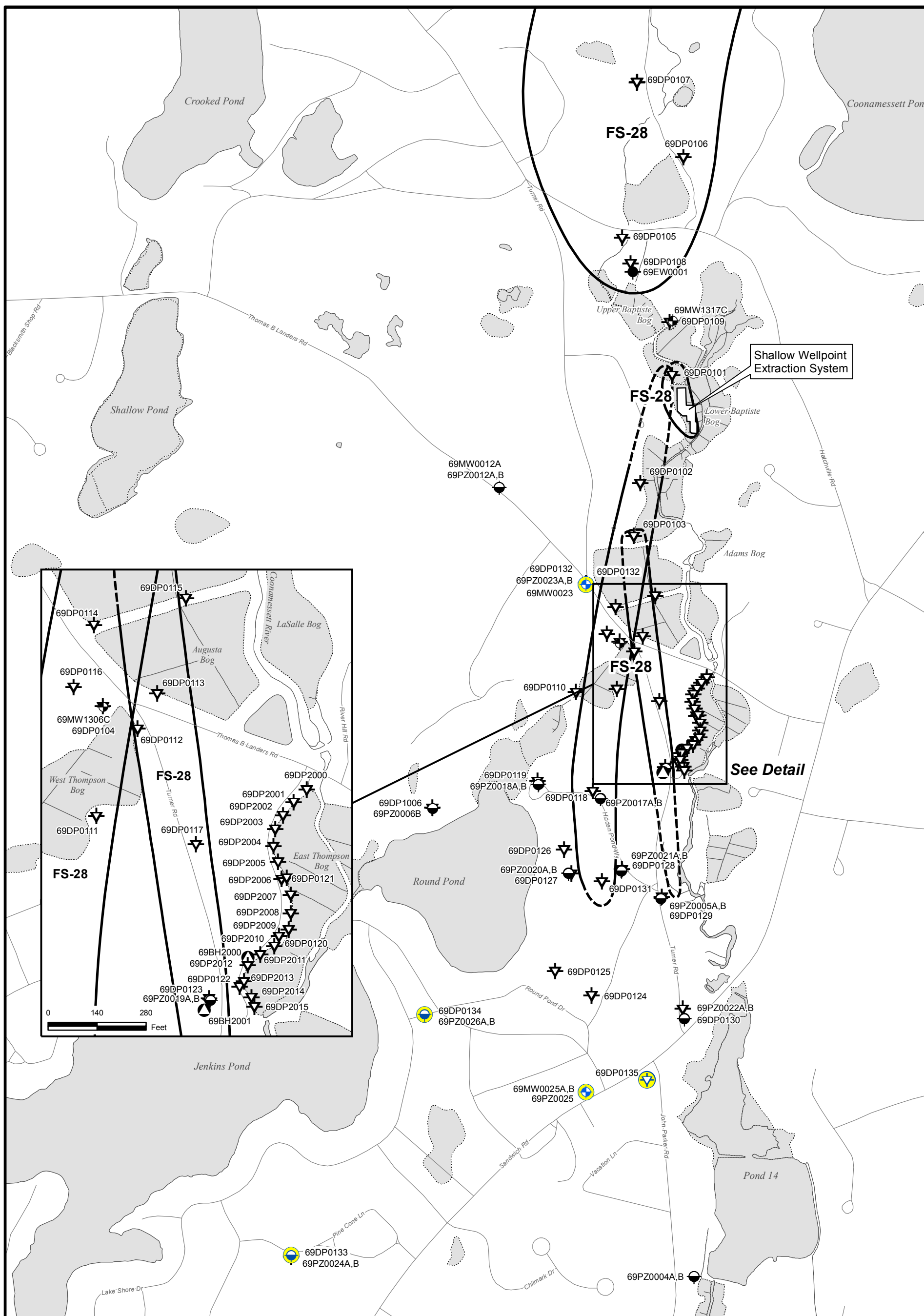
0 1300 Feet

**FIGURE 3-14**

**2006 PLUME SHELL WITH CAPTURE ZONES FOR 69EW0001 AND SWP SYSTEM UNDER CURRENT DESIGN RATES**









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Legend

	*Direct Push Location		Soil Boring
	Monitoring Well		Proposed Direct Push Location
	Piezometer		Proposed Monitoring Well
	Extraction Well		Proposed Piezometer

\*69DP2000 - 69DP2015 are hand-driven pushpoint sample locations.

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

 Shallow Wellpoints  
 Plume Boundary  
 (Dashed Where Inferred)  
 Bog/Wetland



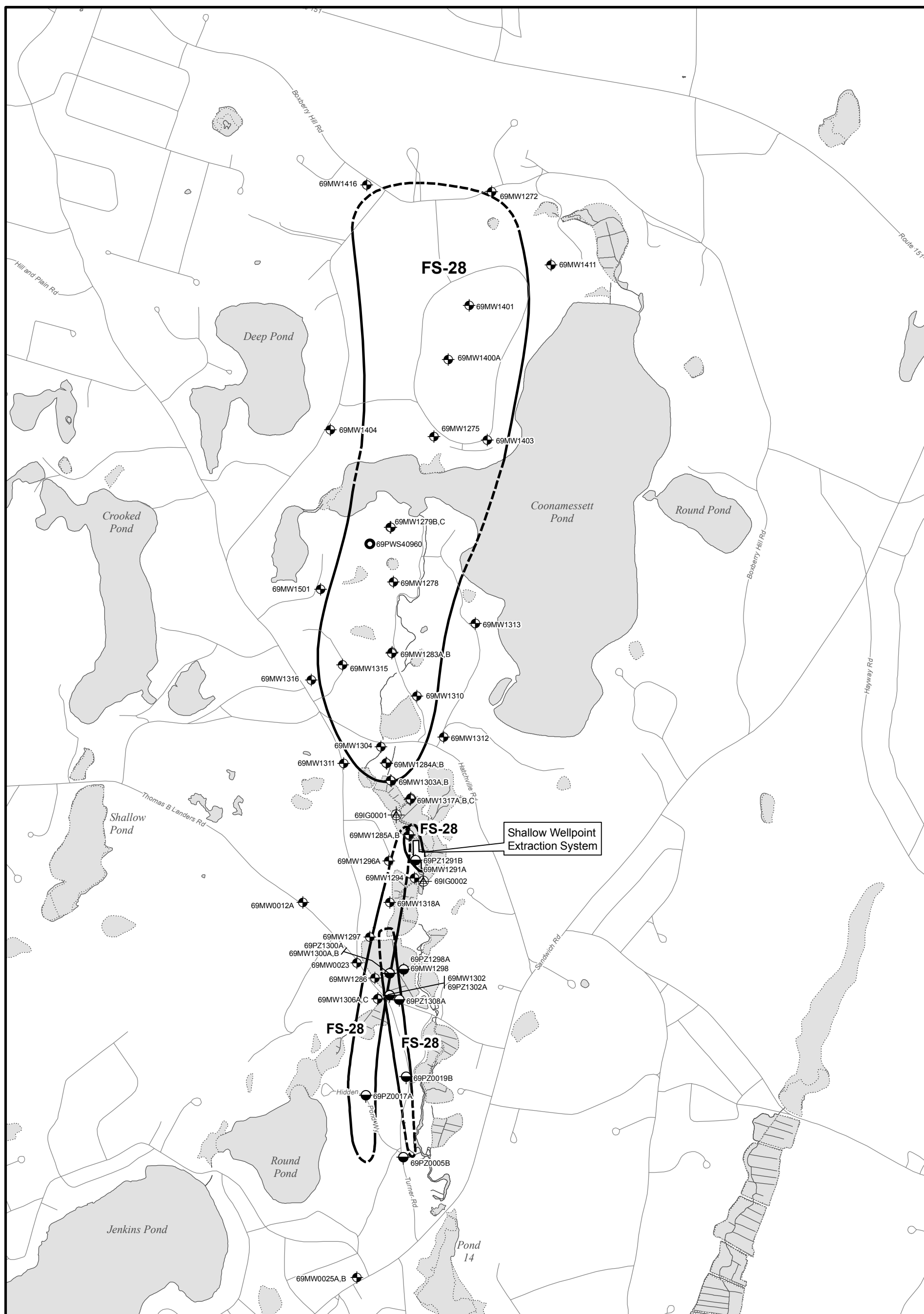
Water Source	Feet
Rainwater	320
Tap Water	640

**FIGURE 5-1**

## PROPOSED FS-28 DRILLING LOCATIONS

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Final FS-28 2005 Plume Update Technical Memorandum

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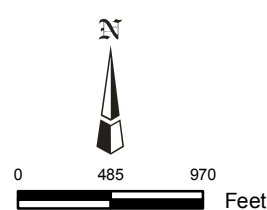


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### Legend

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

- |  |                          |  |   |
|--|--------------------------|--|---|
|  | Monitoring Well          |  | Plume Boundary<br>(Dashed Where Inferred) |
|  | Piezometer               |  | Bog/Wetland                               |
|  | Irrigation Well          |  | Shallow Wellpoints                        |
|  | Public Water Supply Well |  |   |



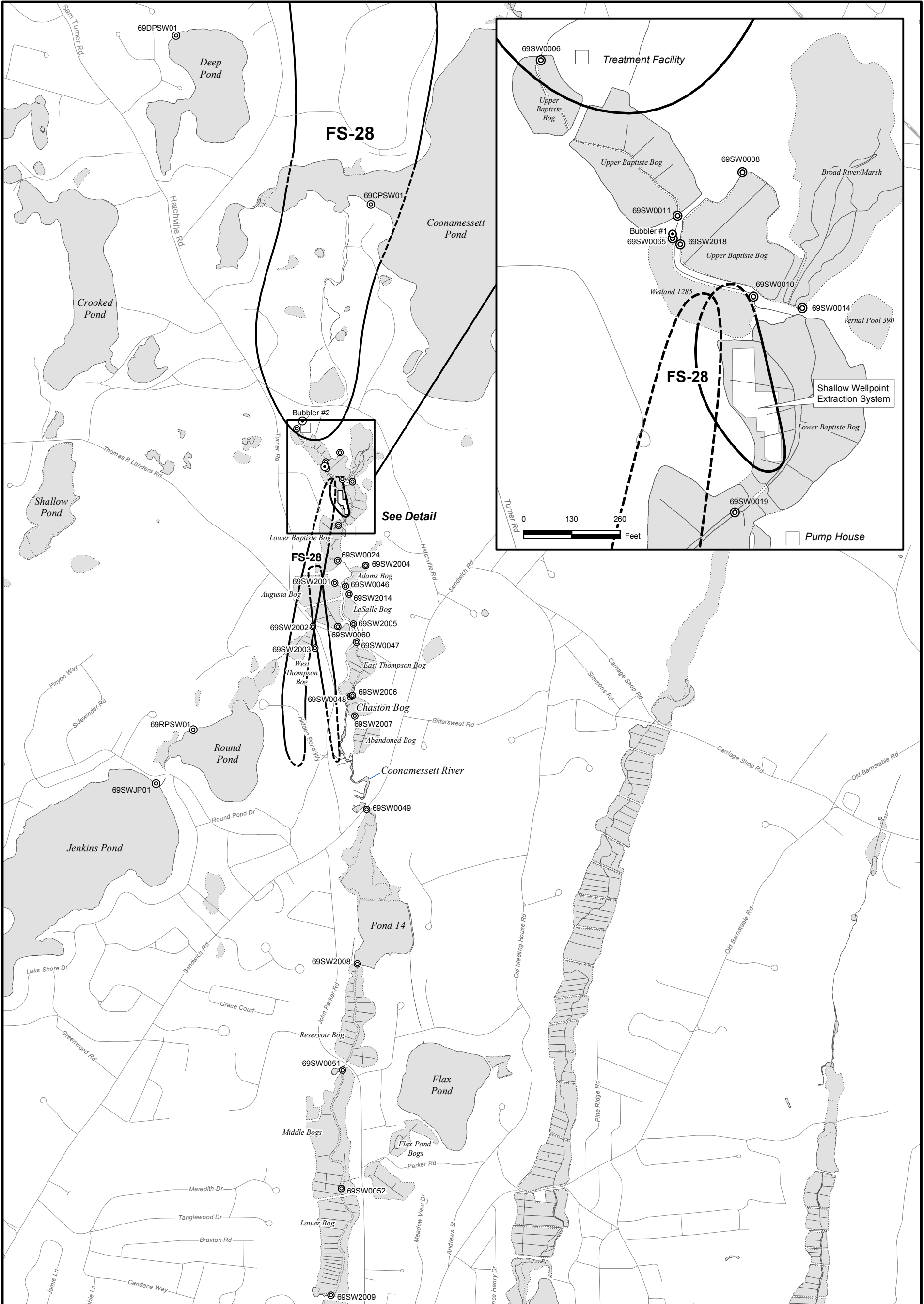
### FIGURE 5-2

## PROPOSED FS-28 GROUNDWATER CHEMICAL MONITORING NETWORK

AFCEE - Massachusetts Military Reservation  
Final FS-28 2005 Plume Update Technical Memorandum

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Legend

- Surface Water Sampling Location
- Bubbler
- Shallow Wellpoints
- Treatment Facility

- Plume Boundary (Dashed Where Inferred)
- Bog/Wetland

Data Source: AFCEE, August 2006, MMR-AFCEE Data Warehouse

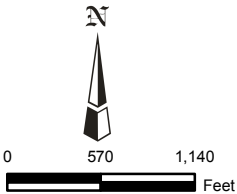


FIGURE 5-3

**PROPOSED FS-28 SURFACE WATER  
CHEMICAL MONITORING NETWORK**  
AFCEE - Massachusetts Military Reservation  
Final FS-28 2005 Plume Update Technical Memorandum

**Table 2-1**  
**FS-28 Well Construction and Surface Water Sampling Location Information**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location	Northing (ft)	Easting (ft)	Surface Elevation (ft msl)	Total Depth (ft bgs)	Measuring Point Elevation (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)
04HW6S	221435	852852	25.41	8.22	26.55	20.16	17.16	3
69BH2000	221057	853558	25	75	N/A	N/A	N/A	N/A
69BH2001	220906	853433	30	249	N/A	N/A	N/A	N/A
69DP0101 <sup>(1)</sup>	223549	853494	26	245	26.00	N/A	N/A	N/A
69DP0102 <sup>(1)</sup>	222830	853282	27	206	27.00	N/A	N/A	N/A
69DP0103 <sup>(1)</sup>	222477	853239	24	226	24.00	N/A	N/A	N/A
69DP0104 <sup>(1)</sup>	221771	853144	26	203	25.70	N/A	N/A	N/A
69DP0105 <sup>(1)</sup>	224467	853161	31	177	31.00	N/A	N/A	N/A
69DP0106 <sup>(1)</sup>	225005	853569	34	252	34.00	N/A	N/A	N/A
69DP0107 <sup>(1)</sup>	225507	853261	38	58	38.00	N/A	N/A	N/A
69DP0107A <sup>(1)</sup>	225505	853260	38	98	38.00	N/A	N/A	N/A
69DP0108 <sup>(1)</sup>	224296	853217	29	199	29.00	N/A	N/A	N/A
69DP0109 <sup>(1)</sup>	223905	853479	28	239	28.00	N/A	N/A	N/A
69DP0110 <sup>(1)</sup>	221435	852852	26	217	26.00	N/A	N/A	N/A
69DP0111 <sup>(1)</sup>	221457	853125	24	227	24.00	N/A	N/A	N/A
69DP0112 <sup>(1)</sup>	221707	853243	24	200	24.00	N/A	N/A	N/A
69DP0113 <sup>(1)</sup>	221808	853299	27	188	27.00	N/A	N/A	N/A
69DP0114 <sup>(1)</sup>	222003	853118	28	185	28.00	N/A	N/A	N/A
69DP0115 <sup>(1)</sup>	222080	853382	27	188	27.00	N/A	N/A	N/A
69DP0116 <sup>(1)</sup>	221826	853060	32	199	32.00	N/A	N/A	N/A
69DP0117 <sup>(1)</sup>	221376	853410	27	152	27.00	N/A	N/A	N/A
69DP0118	220775	852966	44	235	44.00	N/A	N/A	N/A
69DP0119	220843	852597	34	220	34.00	N/A	N/A	N/A
69DP0120 <sup>(1)</sup>	221114	853648	22	205	22.00	N/A	N/A	N/A
69DP0121 <sup>(1)</sup>	221277	853655	21	215	21.00	N/A	N/A	N/A
69DP0122 <sup>(1)</sup>	220969	853535	23	215	23.00	N/A	N/A	N/A
69DP0123	220936	853448	28	190	28.00	N/A	N/A	N/A
69DP0124 <sup>(1)</sup>	219413	852958	58	190	58.00	N/A	N/A	N/A
69DP0125 <sup>(1)</sup>	219575	852714	54	182	54.00	N/A	N/A	N/A
69DP0126 <sup>(1)</sup>	220385	852774	54	200	54.00	N/A	N/A	N/A
69DP0127	220226	852821	60	220	60.00	N/A	N/A	N/A
69DP0128	220255	853160	34	200	34.30	N/A	N/A	N/A
69DP0129	220070	853425	26	210	26.00	N/A	N/A	N/A
69DP0130	219322	853566	26	175	26.00	N/A	N/A	N/A
69DP0131 <sup>(1)</sup>	220173	853026	48	235	48.00	N/A	N/A	N/A
69DP1006 <sup>(1)</sup>	220664	851894	37	72	37.00	N/A	N/A	N/A
69DP1013 <sup>(1)</sup>	224700	849860	37	127	37.00	N/A	N/A	N/A
69DP2000 <sup>(1)</sup>	221536	853722	18	3	18.00	15	15	N/A
69DP2001 <sup>(1)</sup>	221502	853685	18	2	18.00	16	16	N/A
69DP2002 <sup>(1)</sup>	221464	853652	18	2	18.00	16	16	N/A
69DP2003 <sup>(1)</sup>	221421	853627	18	2	18.00	16	16	N/A
69DP2004 <sup>(1)</sup>	221371	853625	18	2	18.00	16	16	N/A
69DP2005 <sup>(1)</sup>	221323	853637	18	2	18.00	16	16	N/A
69DP2006 <sup>(1)</sup>	221277	853657	18	2	18.00	16	16	N/A
69DP2007 <sup>(1)</sup>	221229	853672	18	2	18.00	16	16	N/A
69DP2008 <sup>(1)</sup>	221179	853673	18	2	18.00	16	16	N/A
69DP2009 <sup>(1)</sup>	221130	853663	18	2	18.00	16	16	N/A

**Table 2-1**  
**FS-28 Well Construction and Surface Water Sampling Location Information**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location	Northing (ft)	Easting (ft)	Surface Elevation (ft msl)	Total Depth (ft bgs)	Measuring Point Elevation (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)
69DP2010 <sup>(1)</sup>	221094	853629	18	2	18.00	16	16	N/A
69DP2011 <sup>(1)</sup>	221065	853588	18	2	18.00	16	16	N/A
69DP2012 <sup>(1)</sup>	221032	853551	18	2	18.00	16	16	N/A
69DP2013 <sup>(1)</sup>	220983	853540	18	2	18.00	16	16	N/A
69DP2014 <sup>(1)</sup>	220937	853560	18	2	18.00	16	16	N/A
69DP2015 <sup>(1)</sup>	220940	853565	18	2	18.00	16	16	N/A
69EW0001	224250	853233	31	207	30.32	-108.75	-169.55	61
69EW3001	223473	853581	26	13	26.89	16.35	14.05	2
69EW3002	223463	853581	26	13	27.01	16.15	13.85	2
69EW3003	223452	853582	26	13	27.06	16.05	13.75	2
69EW3004	223442	853582	26	13	26.98	16.05	13.75	2
69EW3005	223432	853582	26	13	27.04	16.05	13.75	2
69EW3006	223423	853582	26	13	27.10	16.05	13.75	2
69EW3007	223472	853571	26	13	27.09	16.05	13.75	2
69EW3008	223462	853571	26	13	27.05	16.05	13.75	2
69EW3009	223452	853572	26	13	26.99	16.05	13.75	2
69EW3010	223442	853572	26	13	27.03	16.05	13.75	2
69EW3011	223432	853572	26	13	26.94	16.05	13.75	2
69EW3012	223422	853572	26	13	26.95	16.05	13.75	2
69EW3014	223462	853561	26	13	27.11	16.05	13.75	2
69EW3015	223452	853562	26	13	27.12	16.05	13.75	2
69EW3016	223442	853562	26	13	27.05	16.05	13.75	2
69EW3017	223432	853562	26	13	27.12	16.05	13.75	2
69EW3018	223422	853562	26	13	26.95	16.05	13.75	2
69EW3019	223472	853551	26	13	27.15	16.05	13.75	2
69EW3020	223461	853551	26	13	27.08	16.05	13.75	2
69EW3021	223451	853551	26	13	27.10	16.05	13.75	2
69EW3022	223441	853552	26	13	26.98	16.35	14.05	2
69EW3023	223431	853552	26	13	27.11	16.05	13.75	2
69EW3024	223422	853552	26	13	26.97	16.05	13.75	2
69EW3025	223471	853541	26	13	27.06	16.05	13.75	2
69EW3026	223461	853541	26	13	26.95	16.05	13.75	2
69EW3027	223451	853541	26	13	27.13	16.05	13.75	2
69EW3028	223441	853542	26	13	26.98	16.05	13.75	2
69EW3029	223431	853542	26	13	26.97	16.05	13.75	2
69EW3030	223422	853542	26	13	27.08	16.05	13.75	2
69EW3031	223471	853531	26	13	26.97	16.05	13.75	2
69EW3032	223460	853531	26	13	27.18	16.05	13.75	2
69EW3033	223451	853531	26	13	27.52	16.35	14.05	2
69EW3034	223441	853531	26	13	27.09	15.95	13.65	2
69EW3035	223431	853531	26	13	27.00	16.05	13.75	2
69EW3036	223421	853532	26	13	27.11	16.05	13.75	2
69EW3037	223411	853533	26	13	27.40	16.75	13.75	3
69EW3038	223411	853542	26	13	27.10	16.75	13.75	3
69EW3039	223411	853552	26	13	27.32	16.75	13.75	3
69EW3041	223412	853572	26	13	27.05	16.75	13.75	3
69EW3043	223402	853583	26	13	27.03	16.75	13.75	3



**Table 2-1**  
**FS-28 Well Construction and Surface Water Sampling Location Information**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location	Northing (ft)	Easting (ft)	Surface Elevation (ft msl)	Total Depth (ft bgs)	Measuring Point Elevation (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)
69EW3045	223402	853562	26	13	26.94	16.75	13.75	3
69EW3046	223402	853552	26	13	26.87	16.75	13.75	3
69EW3047	223402	853542	26	13	26.85	16.75	13.75	3
69EW3048	223402	853532	26	13	26.88	16.75	13.75	3
69EW3049	223392	853532	26	13	27.69	16.75	13.75	3
69EW3050	223392	853542	26	13	27.08	16.75	13.75	3
69EW3051	223391	853552	26	13	26.78	16.75	13.75	3
69EW3052	223392	853562	26	13	26.71	16.75	13.75	3
69EW3053	223391	853572	26	13	26.83	16.75	13.75	3
69EW3054	223392	853583	26	13	26.83	16.75	13.75	3
69EW3055	223381	853552	26	13	27.12	16.75	13.75	3
69EW3056	223381	853542	26	13	27.13	16.75	13.75	3
69EW3057	223382	853533	26	13	27.34	16.75	13.75	3
69EW3060	223372	853562	26	13	26.81	16.75	13.75	3
69EW3061	223372	853552	26	13	26.99	16.75	13.75	3
69EW3065	223362	853542	26	13	26.99	16.75	13.75	3
69EW3066	223361	853553	26	13	26.94	16.75	13.75	3
69EW3078	223352	853563	26	13	26.89	16.75	13.75	3
69EW3080	223351	853543	26	13	27.11	16.75	13.75	3
69EW3081	223351	853532	26	13	27.02	16.75	13.75	3
69EW3082	223341	853533	26	13	27.15	16.75	13.75	3
69EW3088	223343	853595	26	13	26.88	16.75	13.75	3
69EW3097	223333	853615	26	13	27.07	16.75	13.75	3
69EW3103	223332	853553	26	13	27.41	16.75	13.75	3
69EW3106	223321	853533	26	13	27.11	16.75	13.75	3
69EW3127	223312	853553	26	13	27.36	16.75	13.75	3
69EW3128	223312	853543	26	13	27.37	16.75	13.75	3
69EW3131	223302	853575	26	13	27.11	16.75	13.75	3
69EW3136	223303	853625	26	13	26.74	16.75	13.75	3
69EW3144	223293	853586	26	13	27.05	16.75	13.75	3
69EW3154	223274	853636	26	13	26.71	16.75	13.75	3
69EW3156	223273	853616	26	13	26.76	16.75	13.75	3
69EW3168	223253	853616	26	13	27.11	16.75	13.75	3
69EW3169	223253	853606	26	13	26.94	16.75	13.75	3
69EW3170	223253	853596	26	13	27.27	16.75	13.75	3
69EW3171	223234	853616	26	13	26.70	16.75	13.75	3
36EW3172	223234	853626	26	13	26.84	16.75	13.75	3
69EW3173	223234	853636	26	13	26.84	16.75	13.75	3
69EW3177	223224	853646	26	13	26.56	16.75	13.75	3
69EW3180	223224	853617	26	13	26.92	16.75	13.75	3
69EW3181	223214	853616	26	13	26.83	16.75	13.75	3
69EW3182	223214	853626	26	13	26.81	16.75	13.75	3
69EW3183	223215	853636	26	13	26.55	16.75	13.75	3
69EW3185	223214	853656	26	13	26.57	16.75	13.75	3
69EW3187	223204	853647	26	13	26.64	16.75	13.75	3
69EW3188	223204	853636	26	13	26.59	16.75	13.75	3
69EW3190	223204	853616	26	13	26.91	16.75	13.75	3

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**FS-28 Well Construction and Surface Water Sampling Location Information**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location	Northing (ft)	Easting (ft)	Surface Elevation (ft msl)	Total Depth (ft bgs)	Measuring Point Elevation (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)
69EW3192	223194	853626	26	13	26.65	16.75	13.75	3
69EW3195	223194	853656	26	13	26.54	16.75	13.75	3
69EW3198	223185	853636	26	13	26.40	16.75	13.75	3
69EW3199	223185	853626	26	13	26.56	16.75	13.75	3
69EW3200	223185	853617	26	13	26.77	16.75	13.75	3
69EW3201	223176	853626	26	13	26.59	16.75	13.75	3
69EW3202	223175	853637	26	13	26.63	16.75	13.75	3
69EW3203	223175	853647	26	13	26.48	16.75	13.75	3
69EW3204	223175	853656	26	13	26.46	16.75	13.75	3
69IG0001	223750	853345	27	NA	26.55	NA	NA	NA
69IG0002	223038	853637	28	NA	27.95	NA	NA	NA
69IG0012	221962	853740	24	49	26.00	-14.3	-24.3	10
69IG0013	220906	853692	26	55	25.61	-4.4	-24.4	20
69MW0012A	222811	852340	33	253	32.66	-117.12	-121.68	5
69MW0023	NA	NA	NA	NA	NA	NA	NA	NA
69MW0025A	NA	NA	NA	NA	NA	NA	NA	NA
69MW0025B	NA	NA	NA	NA	NA	NA	NA	NA
69MW1271	230541	854836	74	155	73.87	-75.83	-80.83	5
69MW1272	230454	854371	54	103	53.91	-43.79	-48.79	5
69MW1275	227823	853750	43	126	42.48	-78.24	-83.24	5
69MW1278	226256	853313	39	152	39.39	-107.81	-112.81	5
69MW1279A	226830	853308	46	80	45.82	-28.67	-33.67	5
69MW1279B	226843	853279	47	115	47.24	-62.8	-67.8	5
69MW1279C	226842	853287	47	155	49.12	-102.99	-107.99	5
69MW1283A	225500	853301	37	185	38.13	-135.5	-138.5	3
69MW1283B	225494	853297	36	261	38.46	-183.6	-188.6	5
69MW1284A	224304	853243	32	225	33.44	-177.5	-182.5	5
69MW1284B	224309	853238	32	278	33.80	-213.4	-218.4	5
69MW1285A	223533	853482	28	68	30.44	-31.9	-36.9	5
69MW1285B	223537	853484	28	205	30.49	-151.8	-156.8	5
69MW1286	221997	853115	28	195	27.19	-152.5	-157.5	5
69MW1287	222441	853884	27	197	27.15	-162.58	-167.58	5
69MW1290A	223740	852899	59	294	59.08	-175.6	-180.6	5
69MW1290B	223739	852899	59	294	59.08	-229.6	-234.6	5
69MW1291A	223262	853552	29	116	28.84	-81	-86	5
69MW1291B	223258	853555	29	198	28.52	-125.9	-130.9	5
69MW1292	224609	853055	43	165	45.77	-107.1	-112.1	5
69MW1293A	224587	853639	40	190	41.91	-145.49	-150.49	5
69MW1293B	224584	853649	40	268	41.84	-215.5	-220.5	5
69MW1294	223074	853542	24	200	28.09	-15.8	-20.8	5
69MW1295	222433	853264	29	200	28.12	-106.5	-111.5	5
69MW1296A	223257	853264	38	280	37.98	-141.15	-146.15	5
69MW1297	222436	853062	30	213	29.22	-115.4	-120.4	5
69MW1298	222092	853423	27	190	26.27	-108.4	-113.4	5
69MW1299	222109	853581	27	228	26.25	-108.4	-113.4	5
69MW1300A	222044	853273	26	33	25.79	1.2	-3.8	5
69MW1300B	222043	853269	26	180	25.52	-73.9	-78.9	5

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**Final FS-28 2005 Plume Update Technical Memorandum**

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69MW1301	221510	853812	25	238	24.49	-115.1	-120.1	5
69MW1302	221809	853273	27	190	26.35	-73.3	-78.3	5
69MW1303A	224117	853292	31	278	30.68	-171.8	-176.8	5
69MW1303B	224123	853284	31	278	30.94	-211.6	-218.3	7
69MW1304	224480	853179	35	273	36.84	-178.5	-183.5	5
69MW1305	224160	854081	44	263	43.86	-160.8	-165.8	5
69MW1306A	221775	853148	26	245	25.36	-79.3	-84.3	5
69MW1306B	221775	853148	26	245	25.40	-179.3	-184.3	5
69MW1306C	221772	853145	26	147	25.48	-115.27	-120.27	5
69MW1307	223252	852841	56	230	55.85	-128.7	-133.7	5
69MW1308	221765	853376	27	253	26.72	-88.4	-93.4	5
69MW1309	221709	853512	27	228	27.06	-98.64	-103.64	5
69MW1310	225029	853565	33	263	32.88	-197.2	-207.2	10
69MW1311	224307	852781	61	285	60.97	-169	-174	5
69MW1312	224590	853854	44	250	44.22	-150.59	-155.59	5
69MW1313	225810	854197	71	270	70.58	-144.09	-149.09	5
69MW1315	225364	852764	59	300	59.03	-173.7	-178.7	5
69MW1316	225201	852431	52	273	51.61	-188.05	-193.05	5
69MW1317A	223919	853494	31	245	30.22	-139.44	-144.44	5
69MW1317B	223931	853501	31	146	30.34	-108.23	-113.05	5
69MW1317C	223920	853499	31	93	30.22	-57.2	-62.2	5
69MW1318A	222810	853276	28	220	27.03	-127.48	-132.48	5
69MW1400A	228652	853906	46	241	45.40	-104.37	-109.37	5
69MW1401	229230	854128	48	221	47.16	-107.32	-112.32	5
69MW1403	227788	854325	62	264	61.84	-152.94	-157.94	5
69MW1404	227893	852635	68	298	67.16	-37.35	-42.35	5
69MW1411	229668	855009	89	258	87.97	-131.42	-136.42	5
69MW1416	230528	853029	77	236	76.69	-42.92	-47.92	5
69MW1419	232297	854035	60	250	62.88	-50.09	-55.09	5
69MW1501	226177	852532	64	275	63.06	-25.06	-30.06	5
69PWS40960	226666	853060	37	60	37.2	-13	-23	10
69PZ0001A	224544	855253	38	96	37.79	-51.86	-56.86	5
69PZ0001B	224546	855251	38	36	37.97	8.22	3.22	5
69PZ0002A	229270	855811	38	96	37.49	-52.33	-57.33	5
69PZ0002B	229271	855813	38	36	37.44	7.61	2.61	5
69PZ0004A	217545	853641	17	178	16.77	-154.04	-158.6	5
69PZ0004B	217545	853641	17	178	16.74	-33.09	-37.65	5
69PZ0005A	220069	853420	26	184	25.71	-150.46	-155.46	5
69PZ0005B	220066	853420	26	46	25.78	-13.95	-18.95	5
69PZ0006B	220666	851896	37	72	NA	-14	-19	5
69PZ0012A	222811	852340	33	253	32.72	-192.74	-197.3	5
69PZ0012B	222811	852341	33	253	32.75	-16.73	-21.46	5
69PZ0013A	224699	849860	37	173	36.94	-130.89	-135.89	5
69PZ0013B	224698	849865	38	52	37.25	-7.86	-12.86	5
69PZ0017A	220736	853018	46	186	45.6	-131.28	-136.28	5
69PZ0017B	220733	853015	46	74	45.45	-22.37	-27.37	5
69PZ0018A	220830	852605	32	186	32.16	-144.81	-149.81	5

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**Final FS-28 2005 Plume Update Technical Memorandum**

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69PZ0018B	220826	852602	32	60	31.83	-20	-25	5
69PZ0019A	220935	853449	28	164	27.74	-129.79	-134.79	5
69PZ0019B	220933	853452	28	48	27.46	-10.23	-15.23	5
69PZ0020A	220237	852802	64	182	63.44	-112.72	-117.72	5
69PZ0020B	220234	852804	64	60	63.35	10.93	5.93	5
69PZ0021A	220251	853154	34	162	34.13	-122.41	-127.41	5
69PZ0021B	220250	853158	34	46	34.11	-5.02	-10.02	5
69PZ0022A	219269	853575	25	171	24.64	-135.69	-140.69	5
69PZ0022B	219265	853576	25	52	24.65	-19.68	-24.68	5
69PZ0100	221524	853698	25	15	24.74	10	15	5
69PZ0101	221495	853676	25	20	24.79	15	20	5
69PZ0117	223521	853858	26	6	29.35	21.29	20.29	1
69PZ0118	224295	853142	32	10	31.55	24.58	21.68	2.9
69PZ0119	224383	853332	31	12	32.52	22.38	19.48	2.9
69PZ0120	224133	853160	29	10	30.59	22.55	19.65	2.9
69PZ0121	224833	853434	29	7	30.86	24.61	21.71	2.9
69PZ0122	222639	853633	24	5	26.72	22.56	19.66	2.9
69PZ1283A	225499	853301	37	15	38.19	26.5	21.5	5
69PZ1283B	225499	853301	37	85	38.25	-43.5	-48.5	5
69PZ1283C	225494	853297	36	130	38.46	-88.59	-93.59	5
69PZ1286A	221997	853115	27	195	27.15	17.46	12.46	5
69PZ1287A	222441	853884	27	197	27.15	17.42	12.42	5
69PZ1291A	223262	853552	29	15	28.83	19.03	14.03	5
69PZ1291B	223262	853552	29	50	28.83	-15.97	-20.97	5
69PZ1297A	222435	853062	30	20	29.08	14.56	9.56	5
69PZ1297B	222435	853062	30	213	29.09	-45.44	-50.44	5
69PZ1298A	222092	853423	27	20	26.2	11.56	6.56	5
69PZ1298B	222092	853423	27	190	26.2	-28.44	-33.44	5
69PZ1299A	222108	853581	27	15	26.15	16.63	11.63	5
69PZ1299B	222108	853581	27	70	26.18	-38.37	-43.37	5
69PZ1300A	222044	853273	26	20	25.79	11.16	6.16	5
69PZ1300B	222043	853269	26	180	25.56	-33.92	-38.92	5
69PZ1301A	221510	853812	25	238	24.21	14.93	9.93	5
69PZ1301B	221510	853812	25	238	24.22	-45.07	-50.07	5
69PZ1302A	221808	853273	27	20	26.35	11.66	6.66	5
69PZ1302B	221808	853273	27	190	26.32	-28.34	-33.34	5
69PZ1308A	221764	853376	27	15	26.51	17.11	12.11	5
69PZ1308B	221764	853376	27	253	26.5	-42.89	-47.89	5
69PZ1309A	221709	853512	27	228	26.94	17.36	12.36	5
69PZ1309B	221709	853512	27	75	26.93	-42.64	-47.64	5
69PZ1318	222810	853276	28	220	27.05	25.52	20.52	5
USFW441047	221950	854658	59	47	60.19	14.39	12.39	2
USFW479009	221234	853982	26	9	27.50	18.8	16.8	2
USFW479024	221234	853982	27	24	27.67	5.17	3.17	2
USFW479078	221234	853982	27	79	28.03	-49.47	-51.47	2
USFW479114	221234	853982	27	115	27.92	-85.58	-87.58	2
USFW480042	222659	854651	61	43.9	62.02	20.12	18.12	2

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**Final FS-28 2005 Plume Update Technical Memorandum**

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USFW483013	217742	853558	21	13	22.81	10.71	8.71	2
USFW483028	217740	853572	21	114	22.94	-5.56	-7.56	2
USFW483079	217739	853567	21	114	22.91	-55.59	-57.59	2
USFW483113	217741	853564	21	114	22.91	-90.59	-92.59	2
USFW486006	218579	853993	16	6	20.57	11.37	9.37	2
USFW486024	218579	853993	19	24	20.41	-2.54	-4.54	2
USFW486073	218579	853993	19	76	20.40	-54.1	-56.1	2
USFW486115	218579	853993	19	115	20.22	-93.28	-95.28	2
69SG0046-04	222278	853620	N/A	N/A	21.88	N/A	N/A	N/A
69SG0049-06	219472	853889	N/A	N/A	16.00	N/A	N/A	N/A
69SG0057-04	226985	853590	N/A	N/A	34.96	N/A	N/A	N/A
69SW0006	224248	853012	N/A	N/A	N/A	N/A	N/A	N/A
69SW0008	223868	853489	N/A	N/A	N/A	N/A	N/A	N/A
69SW0010	223613	853584	N/A	N/A	N/A	N/A	N/A	N/A
69SW0011	223830	853380	N/A	N/A	N/A	N/A	N/A	N/A
69SW0014	223582	853714	N/A	N/A	N/A	N/A	N/A	N/A
69SW0019	223033	853534	N/A	N/A	N/A	N/A	N/A	N/A
69SW0024	222590	853526	N/A	N/A	N/A	N/A	N/A	N/A
69SW0046	222272	853626	N/A	N/A	N/A	N/A	N/A	N/A
69SW0047	221570	853763	N/A	N/A	N/A	N/A	N/A	N/A
69SW0048	220889	853688	N/A	N/A	N/A	N/A	N/A	N/A
69SW0049	219473	853890	N/A	N/A	N/A	N/A	N/A	N/A
69SW0051	216204	853589	N/A	N/A	N/A	N/A	N/A	N/A
69SW0052	214723	853573	N/A	N/A	N/A	N/A	N/A	N/A
69SW0060	221766	853529	N/A	N/A	N/A	N/A	N/A	N/A
69SW0065	223792	853379	N/A	N/A	N/A	N/A	N/A	N/A
69SW2001	222314	853493	N/A	N/A	N/A	N/A	N/A	N/A
69SW2002	221764	853216	N/A	N/A	N/A	N/A	N/A	N/A
69SW2003	221496	853245	N/A	N/A	N/A	N/A	N/A	N/A
69SW2004	222532	853879	N/A	N/A	N/A	N/A	N/A	N/A
69SW2005	221795	853726	N/A	N/A	N/A	N/A	N/A	N/A
69SW2006	220900	853715	N/A	N/A	N/A	N/A	N/A	N/A
69SW2007	220644	853739	N/A	N/A	N/A	N/A	N/A	N/A
69SW2008	217539	853773	N/A	N/A	N/A	N/A	N/A	N/A
69SW2009	213383	853442	N/A	N/A	N/A	N/A	N/A	N/A
69SW2010	217628	854433	N/A	N/A	N/A	N/A	N/A	N/A
69SW2012	214890	853854	N/A	N/A	N/A	N/A	N/A	N/A
69SW2014	222172	853671	N/A	N/A	N/A	N/A	N/A	N/A
69SW2018	223754	853373	N/A	N/A	N/A	N/A	N/A	N/A
69SW2019	215571	854351	N/A	N/A	N/A	N/A	N/A	N/A
69SW4001	221730	853619	N/A	N/A	N/A	N/A	N/A	N/A
69SW4002	221982	853767	N/A	N/A	N/A	N/A	N/A	N/A
69SW4003	221444	853641	N/A	N/A	N/A	N/A	N/A	N/A
69SW4004	221241	853683	N/A	N/A	N/A	N/A	N/A	N/A
69SW4005	221069	853602	N/A	N/A	N/A	N/A	N/A	N/A
69SW4006	220892	853582	N/A	N/A	N/A	N/A	N/A	N/A
69SWDP01	229171	851471	N/A	N/A	N/A	N/A	N/A	N/A

**Table 2-1**  
**FS-28 Well Construction and Surface Water Sampling Location Information**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location	Northing (ft)	Easting (ft)	Surface Elevation (ft msl)	Total Depth (ft bgs)	Measuring Point Elevation (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)
69SWCP01	227058	853600	N/A	N/A	N/A	N/A	N/A	N/A
69SWJP01	219797	851248	N/A	N/A	N/A	N/A	N/A	N/A
69SWRP01	220472	851772	N/A	N/A	N/A	N/A	N/A	N/A

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Note:

1. Locations have not been surveyed, data is approximated.

Key:

bgs = below ground surface

ft = feet

msl = mean sea level

NA = information not available

N/A = information not applicable

**Table 3-1**  
**Hydraulic Monitoring Results**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Measurement Point Elevation (ft msl)	Distance to Water (ft below MPE)	Water Level Elevation (ft msl)
69MW0012A	11/1/2005	32.66	7.84	24.82
69MW1271	10/27/2004	73.87	35.89	37.98
69MW1275	10/27/2004	42.48	8.68	33.80
69MW1278	10/27/2004	39.39	7.89	31.50
69MW1279A	10/27/2004	45.82	14.01	31.81
69MW1279B	10/27/2004	47.24	15.30	31.94
69MW1279C	10/27/2004	49.12	17.25	31.87
69MW1283A	10/27/2004	38.13	8.13	30.00
69MW1284A	10/27/2004	33.44	7.63	25.81
69MW1284B	10/27/2004	33.80	7.33	26.47
69MW1285A	10/27/2004	30.44	4.79	25.65
69MW1286	11/1/2005	27.19	3.76	23.43
69MW1286	3/9/2006	27.19	2.71	24.48
69MW1287	11/1/2005	27.15	2.48	24.67
69MW1287	3/10/2006	27.15	1.3	25.85
69MW1290A	10/27/2004	59.08	32.82	26.26
69MW1290A	5/18/2005	59.08	31.82	27.26
69MW1290B	10/27/2004	59.08	32.69	26.39
69MW1290B	5/18/2005	59.08	31.67	27.41
69MW1292	10/27/2004	45.77	17.99	27.78
69MW1292	5/18/2005	45.77	16.59	29.18
69MW1293A	10/27/2004	41.91	13.90	28.01
69MW1293B	10/27/2004	41.84	13.80	28.04
69MW1294	10/27/2004	28.09	3.09	25.00
69MW1294	5/18/2005	28.09	3.04	25.05
69MW1296A	3/9/2006	37.98	10.98	27
69MW1296B	3/9/2006	37.98	10.88	27.1
69MW1297	11/1/2005	29.22	4.99	24.23
69MW1297	3/9/2006	29.22	3.86	25.36
69MW1298	11/1/2005	26.27	2.44	23.83
69MW1299	11/1/2005	26.25	2.36	23.89
69MW1299	3/9/2006	26.25	1.25	25
69MW1300A	5/18/2005	25.79	2.02	23.77
69MW1300A	11/1/2005	25.79	2.19	23.60
69MW1300A	3/9/2006	25.79	1.16	24.63
69MW1300B	10/27/2004	25.52	2.10	23.42
69MW1300B	5/18/2005	25.52	1.62	23.90
69MW1300B	11/1/2005	25.52	1.95	23.57
69MW1300B	3/9/2006	25.52	0.89	24.63
69MW1301	11/1/2005	20.95	1.28	19.67
69MW1302	10/27/2004	26.35	3.43	22.92
69MW1302	5/18/2005	26.35	2.82	23.53
69MW1302	11/1/2005	26.35	3.21	23.14
69MW1302	3/10/2006	26.35	2.18	24.17
69MW1303A	10/27/2004	30.68	4.34	26.34
69MW1303B	10/27/2004	30.94	4.59	26.35
69MW1304	10/27/2004	36.84	9.62	27.22
69MW1306A	10/27/2004	25.36	5.57	19.79

**Table 3-1**  
**Hydraulic Monitoring Results**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Measurement Point Elevation (ft msl)	Distance to Water (ft below MPE)	Water Level Elevation (ft msl)
69MW1306A	5/18/2005	25.36	4.93	20.43
69MW1306A	11/1/2005	25.36	5.31	20.05
69MW1306A	3/9/2006	28.38	4.3	24.08
69MW1306B	5/18/2005	25.40	4.85	20.55
69MW1306B	11/1/2005	25.40	5.25	20.15
69MW1306B	3/9/2006	28.16	4.23	23.93
69MW1307	10/27/2004	55.85	30.44	25.41
69MW1307	5/18/2005	55.85	29.64	26.21
69MW1307	3/10/2006	55.85	28.91	26.94
69MW1308	11/1/2005	26.72	3.6	23.12
69MW1308	3/10/2006	26.72	2.56	24.16
69MW1309	11/1/2005	27.06	3.95	23.11
69MW1309	3/10/2006	27.06	2.95	24.11
69MW1310	10/27/2004	32.88	3.50	29.38
69MW1318A	11/1/2005	27.03	2.21	24.82
69MW1318A	3/9/2006	27.03	0.95	26.08
69MW1401	10/27/2004	47.16	12.06	35.10
69MW1403	10/27/2004	61.84	28.18	33.66
69MW1404	10/27/2004	67.16	33.70	33.46
69MW1416	10/27/2004	76.69	39.66	37.03
69PZ0001A	10/27/2004	37.79	7.67	30.12
69PZ0001B	10/27/2004	37.97	7.75	30.22
69PZ0002A	10/27/2004	37.49	2.55	34.94
69PZ0002B	10/27/2004	37.44	2.58	34.86
69PZ0004A	11/1/2005	16.77	0.90	15.87
69PZ0004A	3/10/2006	16.77	0.05	16.72
69PZ0004B	11/1/2005	16.74	1.98	14.76
69PZ0004B	3/10/2006	16.74	1.08	15.66
69PZ0005A	3/10/2006	25.71	5.05	20.66
69PZ0005B	3/10/2006	25.78	5.32	20.46
69PZ0012A	11/1/2005	32.72	7.52	25.20
69PZ0012A	3/9/2006	32.72	6.72	26
69PZ0012A	3/10/2006	32.72	6.61	26.11
69PZ0012B	11/1/2005	32.75	7.84	24.91
69PZ0012B	3/10/2006	32.75	6.72	26.03
69PZ0017A	11/1/2005	NM	NM	NM
69PZ0017A	3/10/2006	45.6	23.69	21.91
69PZ0017B	11/1/2005	45.45	24.22	21.23
69PZ0017B	3/10/2006	45.45	23.4	22.05
69PZ0018A	11/1/2005	32.16	10.70	21.46
69PZ0018A	3/10/2006	32.16	9.92	22.24
69PZ0018B	11/1/2005	31.83	10.37	21.46
69PZ0018B	3/10/2006	31.83	9.62	22.21
69PZ0019A	11/1/2005	27.74	6.02	21.72
69PZ0019A	3/10/2006	27.74	5.18	22.56
69PZ0019B	11/1/2005	27.46	5.87	21.59
69PZ0019B	3/10/2006	27.46	5	22.46
69PZ0020A	11/1/2005	63.44	42.97	20.47



**Table 3-1**  
**Hydraulic Monitoring Results**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Measurement Point Elevation (ft msl)	Distance to Water (ft below MPE)	Water Level Elevation (ft msl)
69PZ0020A	3/10/2006	63.44	42.22	21.22
69PZ0020B	11/1/2005	63.35	42.99	20.36
69PZ0020B	3/10/2006	63.35	42.24	21.11
69PZ0021A	11/1/2005	34.13	13.85	20.28
69PZ0021A	3/10/2006	34.13	13.15	20.98
69PZ0021B	11/1/2005	34.11	13.75	20.36
69PZ0021B	3/10/2006	34.11	13.08	21.03
69PZ0022A	3/10/2006	24.64	5.67	18.97
69PZ0022B	3/10/2006	24.65	5.72	18.93
69PZ0100	11/1/2005	24.74	2.56	22.18
69PZ0100	3/10/2006	24.74	1.61	23.13
69PZ0101	11/1/2005	24.79	2.51	22.28
69PZ0101	3/10/2006	24.79	1.55	23.24
69PZ0117	10/27/2004	29.35	2.89	26.46
69PZ0118	10/27/2004	31.55	4.62	26.93
69PZ0119	10/27/2004	32.52	5.33	27.19
69PZ0120	10/27/2004	30.59	4.62	25.97
69PZ0121	10/27/2004	30.86	1.89	28.97
69PZ0122	10/27/2004	26.72	2.26	24.46
69PZ0122	5/18/2005	26.72	2.06	24.66
69PZ0122	11/1/2005	26.72	2.36	24.36
69PZ0122	3/10/2006	26.72	1.48	25.24
69PZ1283A	10/27/2004	38.19	8.10	30.09
69PZ1283B	10/27/2004	38.25	8.20	30.05
69PZ1283C	10/27/2004	38.46	8.34	30.12
69PZ1286A	5/18/2005	27.15	3.62	23.53
69PZ1286A	11/1/2005	27.15	3.78	23.37
69PZ1286A	3/9/2006	27.15	2.75	24.4
69PZ1286B	3/9/2006	27.11	2.73	24.38
69PZ1287A	5/18/2005	27.15	2.20	24.95
69PZ1287A	11/1/2005	27.15	2.59	24.56
69PZ1287A	3/10/2006	27.15	7.45	19.7
69PZ1287B	3/10/2006	27.15	1.39	25.76
69PZ1291A	10/27/2004	28.83	3.71	25.12
69PZ1291A	5/18/2005	28.83	3.36	25.47
69PZ1291B	10/27/2004	28.83	3.67	25.16
69PZ1291B	5/18/2005	28.83	3.31	25.52
69PZ1297A	5/18/2005	29.08	5.04	24.04
69PZ1297A	11/1/2005	29.08	4.91	24.17
69PZ1297A	3/9/2006	29.08	3.9	25.18
69PZ1297B	5/18/2005	29.09	4.83	24.26
69PZ1297B	11/1/2005	29.09	4.96	24.13
69PZ1297B	3/9/2006	29.09	3.85	25.24
69PZ1298A	5/20/2005	26.20	2.18	24.02
69PZ1298A	11/1/2005	26.20	2.35	23.85
69PZ1298B	5/20/2005	26.20	2.19	24.01
69PZ1298B	11/1/2005	26.20	2.44	23.76
69PZ1299A	5/18/2005	26.15	2.14	24.01

**Table 3-1**  
**Hydraulic Monitoring Results**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Measurement Point Elevation (ft msl)	Distance to Water (ft below MPE)	Water Level Elevation (ft msl)
69PZ1299A	11/1/2005	26.15	2.40	23.75
69PZ1299A	3/9/2006	26.15	1.47	24.68
69PZ1299B	5/18/2005	26.18	1.99	24.19
69PZ1299B	11/1/2005	26.18	2.32	23.86
69PZ1299B	3/9/2006	26.18	1.32	24.86
69PZ1300A	5/20/2005	25.79	2.05	23.74
69PZ1300A	11/1/2005	25.79	2.23	23.56
69PZ1300A	3/10/2006	25.79	1.2	24.59
69PZ1300B	5/18/2005	25.56	1.71	23.85
69PZ1300B	11/1/2005	25.56	1.92	23.64
69PZ1300B	3/9/2006	25.56	0.94	24.62
69PZ1301A	11/1/2005	24.01	1.68	22.33
69PZ1301A	3/10/2006	24.01	0.72	23.29
69PZ1301B	11/1/2005	23.99	1.58	22.41
69PZ1301B	3/10/2006	23.99	0.61	23.38
69PZ1302A	5/18/2005	26.35	3.02	23.33
69PZ1302A	11/1/2005	26.35	3.08	23.27
69PZ1302A	3/10/2006	26.35	2.08	24.27
69PZ1302B	5/18/2005	26.32	2.94	23.38
69PZ1302B	11/1/2005	26.32	3.17	23.15
69PZ1302B	3/10/2006	26.32	2.16	24.16
69PZ1308A	5/18/2005	26.51	3.40	23.11
69PZ1308A	11/1/2005	26.51	3.24	23.27
69PZ1308A	3/10/2006	26.51	2.28	24.23
69PZ1308B	5/18/2005	26.50	2.93	23.57
69PZ1308B	11/1/2005	26.50	3.32	23.18
69PZ1308B	3/10/2006	26.5	2.29	24.21
69PZ1309A	5/18/2005	26.94	4.00	22.94
69PZ1309A	11/1/2005	26.94	4.03	22.91
69PZ1309A	3/10/2006	26.94	3.18	23.76
69PZ1309B	5/18/2005	26.93	3.64	23.29
69PZ1309B	11/1/2005	26.93	3.91	23.02
69PZ1309B	3/10/2006	26.93	2.91	24.02
69PZ1318	11/1/2005	27.05	2.3	24.75
69SG0046-04	3/10/2006	21.88	-1.82	23.7
69SG0049-06	3/10/2006	16	-1.12	17.12
69SG0057-04	10/27/2004	34.96	0.22	34.74
USFW439045	3/10/2006	59.95	36.38	23.57
USFW441047	11/1/2005	60.19	35.57	24.62
USFW441047	3/10/2006	60.19	34.24	25.95
USFW479009	5/18/2005	27.50	4.66	22.84
USFW479009	11/1/2005	27.50	5.00	22.50
USFW479024	3/10/2006	27.67	4.04	23.63
USFW479024	11/1/2005	27.67	5.16	22.51
USFW479078	5/18/2005	28.03	5.15	22.88
USFW479078	11/1/2005	28.03	5.50	22.53
USFW479114	11/1/2005	27.92	5.18	22.74
USFW479114	3/10/2006	27.92	4.1	23.82

**Table 3-1**  
**Hydraulic Monitoring Results**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Measurement Point Elevation (ft msl)	Distance to Water (ft below MPE)	Water Level Elevation (ft msl)
USFW480042	11/1/2005	62.02	36.02	26.00
USFW480042	3/10/2006	62.02	34.67	27.35

Data Source: AFCEE, April 2006 MMR-AFCEE Data Warehouse

Notes:

ft msl = feet mean sea level

MPE = measuring point elevation

NM = not measured

**Table 3-2**  
**Measured Vertical Hydraulic Gradients in the Uncaptured Portion of the FS-28 Plume**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location	Mid-Screen Elevation (ft msl)	Static Water Elevation (ft msl) Nov-2005	Static Water Elevation (ft msl) Mar-2006	Vertical Gradient Nov-2005	Deepest to Shallowest Nov-2005	Vertical Gradient Mar-2006	Deepest to Shallowest Mar-2006
69MW1286	-155	23.43	24.48	0.00E+00		1.18E-03	
69PZ1286B	-70.04	23.43	24.38	7.06E-04	3.53E-04	-2.35E-04	4.71E-04
69PZ1286A	14.96	23.37	24.4				
69MW1287	-165.08	24.67	25.85	3.16E-04		9.47E-04	
69PZ1287B	-70.08	24.64	25.76	9.41E-04	6.11E-04	NA	NA
69PZ1287A	14.92	24.56	NM				
69MW1296B	-237.8	NM	27.1	NA	NA	1.06E-03	n/a
69MW1296A	-143.65	NM	27				
69MW1297	-117.9	24.23	25.36	1.43E-03		1.72E-03	
69PZ1297B	-47.94	24.13	25.24	-6.67E-04	4.62E-04	1.00E-03	1.39E-03
69PZ1297A	12.06	24.17	25.18				
69MW1299	-110.9	23.89	25	4.28E-04		2.00E-03	
69PZ1299B	-40.87	23.86	24.86	2.00E-03	1.12E-03	3.27E-03	2.56E-03
69PZ1299A	14.13	23.75	24.68				
69MW1300B	-76.4	23.57	24.63	-1.75E-03		2.50E-04	
69PZ1300B	-36.42	23.64	24.62	1.14E-03	1.18E-04	-2.85E-04	4.70E-04
69MW1300A	-1.3	23.6	24.63	4.02E-03		4.02E-03	
69PZ1300A	8.66	23.56	24.59				
69PZ1301B	-47.57	22.41	23.38	1.33E-03	n/a	1.50E-03	n/a
69PZ1301A	12.43	22.33	23.29				
69MW1302	-75.8	23.14	24.17	-2.22E-04		2.22E-04	
69PZ1302B	-30.84	23.15	24.16	-3.00E-03	-1.53E-03	-2.75E-03	-1.18E-03
69PZ1302A	9.16	23.27	24.27				
69MW1306B	-181.74	22.91	23.93	-1.60E-03	n/a	-1.50E-03	n/a
69MW1306A	-81.74	23.07	24.08				
69MW1308	-90.9	23.12	24.16	-1.32E-03		-1.10E-03	
69PZ1308B	-45.39	23.18	24.21	-1.50E-03	-1.42E-03	-3.33E-04	-6.63E-04
69PZ1308A	14.61	23.27	24.23				

**Table 3-2**  
**Measured Vertical Hydraulic Gradients in the Uncaptured Portion of the FS-28 Plume**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location	Mid-Screen Elevation (ft msl)	Static Water Elevation (ft msl) Nov-2005	Static Water Elevation (ft msl) Mar-2006	Vertical Gradient Nov-2005	Deepest to Shallowest Nov-2005	Vertical Gradient Mar-2006	Deepest to Shallowest Mar-2006
69MW1309	-101.14	23.11	24.11	1.61E-03		1.61E-03	
69PZ1309B	-45.14	23.02	24.02	1.83E-03	1.72E-03	4.33E-03	3.02E-03
69PZ1309A	14.86	22.91	23.76				
69PZ0004A	-156.32	15.87	16.72	9.18E-03	n/a	8.76E-03	n/a
69PZ0004B	-35.37	14.76	15.66				
69PZ0005A	-152.96	NM	20.66	NA	n/a	1.47E-03	n/a
69PZ0005B	-16.45	NM	20.46				
69PZ0012A	-195.02	25.2	26	1.65E-03	n/a	-1.71E-04	n/a
69PZ0012B	-19.095	24.91	26.03				
69PZ0017A	-133.78	NM	21.91	NA	n/a	-1.29E-03	n/a
69PZ0017B	-24.87	21.23	22.05				
69PZ0018A	-147.31	21.46	22.24	0.00E+00	n/a	2.40E-04	n/a
69PZ0018B	-22.5	21.46	22.21				
69PZ0019A	-132.29	21.72	22.56	1.09E-03	n/a	8.36E-04	n/a
69PZ0019B	-12.73	21.59	22.46				
69PZ0020A	-8.43	20.47	21.22	6.52E-03	n/a	6.52E-03	n/a
69PZ0020B	8.43	20.36	21.11				
69PZ0021A	-124.91	20.28	20.98	-6.81E-04	n/a	-4.26E-04	n/a
69PZ0021B	-7.52	20.36	21.03				
69PZ0022A	-138.19	NM	18.97	NA	NA	3.45E-04	n/a
69PZ0022B	-22.18	NM	18.93				
USFW479114	-86.58	22.74	23.82	2.53E-03	n/a	2.09E-03	n/a
USFW479024	4.17	22.51	23.63				

Data Source: AFCEE, April 2006, MMR-AFCEE Data Warehouse.

**Key:**

ft msl = feet mean sea level

ft/ft = foot per foot

n/a = not applicable, no additional well screens exists at location

NA = not available

NM = not measured

**Table 3-3**  
**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69DP2000	8/25/2005	ND	15.10	0.49	6.38	83	61.2	-0.8
69DP2001	8/25/2005	ND	16.13	0.50	5.65	85	261	0.6
69DP2002	8/25/2005	ND	15.02	0.46	5.31	77	407	0.8
69DP2003	8/25/2005	ND	16.61	0.56	5.38	87	377	0.8
69DP2004	8/25/2005	ND	18.31	1.29	5.36	76	58.2	17
69DP2005	8/25/2005	ND	16.21	0.47	5.13	83	187	1.1
69DP2006	8/25/2005	ND	20.53	0.23	6.03	116	92.3	12
69DP2007	8/25/2005	ND	15.21	0.50	5.71	76	114	0.6
69DP2008	8/26/2005	ND	17.31	0.57	5.23	67	171	7.3
69DP2009	8/26/2005	ND	17.93	0.56	5.09	76	170	4.5
69DP2010	8/26/2005	ND	17.67	0.58	4.96	72	288	8.7
69DP2011	8/26/2005	ND	16.44	0.52	5.46	91	109	0.1
69DP2012	8/26/2005	ND	17.96	0.55	5.28	79	247	0.8
69DP2013	8/26/2005	ND	17.02	0.54	4.97	103	257	3.5
69DP2014	8/26/2005	ND	20.52	3.34	5.64	151	90.4	3.1
69DP2015	8/26/2005	ND	21.77	4.17	4.72	73	167	34.1
69EW0001	4/2/2004	<b>0.400</b>	11.59	2.41	7.03	86	446	0.6
	5/3/2004	<b>0.373</b>	11.60	2.28	5.84	84	249	-0.5
	6/1/2004	<b>0.399</b>	11.55	2.43	5.81	84	226	-0.7
	6/28/2004	<b>0.394</b>	11.59	2.56	6.27	86	199	1.2
	7/28/2004	<b>0.405</b>	11.57	2.44	6.10	87	219	1.5
	8/26/2004	<b>0.419</b>	11.55	2.57	6.12	85	211	0
	9/27/2004	<b>0.389</b>	11.51	2.56	5.73	85	237	-0.4
	10/25/2004	<b>0.383</b>	10.11	5.18	6.21	115	261	0
	11/29/2004	<b>0.379</b>	11.48	2.46	6.10	86	239	-0.1
	12/29/2004	<b>0.402</b>	11.51	2.49	6.03	86	250	1.5
	1/28/2005	<b>0.324</b>	11.47	2.46	5.73	87	267	-0.4
	2/28/2005	<b>0.395</b>	11.53	2.40	5.97	93	317	0.5
	3/28/2005	<b>0.383</b>	11.55	2.61	6.12	89	251	-0.5
	4/25/2005	<b>0.410</b>	11.61	2.77	6.09	87	238	0
	5/26/2005	<b>0.442</b>	11.32	2.72	5.91	97	147	3.3
	6/27/2005	<b>0.476</b>	11.70	2.83	5.94	88	315	13
	7/25/2005	<b>0.416</b>	11.63	5.88	5.90	83	245	0
	8/29/2005	<b>0.367</b>	11.57	2.66	6.06	88	188	0
	9/29/2005	<b>0.349</b>	11.63	2.43	5.98	86	241	0
	10/26/2005	<b>0.346</b>	11.52	2.45	6.37	83	217	0
	11/28/2005	<b>0.335</b>	11.54	2.56	5.91	83	190	0.5
69EW3001	4/21/2004	ND	11.86	2.42	6.43	80	343	16
	9/24/2004	ND	11.87	4.00	6.61	116	163	4.8
69EW3002	4/21/2004	ND	11.75	3.17	6.07	94	306	62
	7/12/2004	ND	13.01	2.66	6.26	103	70	5.7
69EW3003	9/24/2004	ND	12.12	6.42	6.20	122	142	39
69EW3004	4/21/2004	ND	12.04	4.82	6.15	108	300	56
69EW3005	7/12/2004	ND	14.62	6.83	6.23	133	83.4	5.3
69EW3006	4/21/2004	ND	11.73	4.04	6.22	123	274	51
69EW3007	4/21/2004	BRL	11.91	3.14	6.32	84	327	46
	7/12/2004	ND	13.09	7.32	6.17	93	131	12
69EW3008	9/24/2004	ND	12.06	5.23	6.48	110	206	303
69EW3009	4/20/2004	ND	11.73	3.83	6.13	91	326	49

**Table 3-3**  
**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69EW3010	7/12/2004	ND	13.03	7.14	6.06	90	146	3.06
	9/24/2004	ND	12.45	7.08	5.97	106	306	98
69EW3011	4/21/2004	ND	12.11	7.13	6.19	91	285	59
	9/24/2004	ND	13.06	1.22	6.50	112	345	7.2
69EW3012	7/12/2004	ND	14.78	4.95	6.24	106	91	1.6
69EW3014	4/21/2004	BRL	11.94	3.20	5.95	103	319	566
	9/24/2004	ND	13.82	2.97	5.79	113	318	19
69EW3015	7/12/2004	ND	13.08	5.74	6.14	98	124	13
69EW3016	4/21/2004	0.010	11.73	4.19	6.29	74	-303	400
	9/24/2004	ND	12.83	5.24	6.36	104	374	80
69EW3017	7/12/2004	ND	13.48	3.36	5.33	113	148	220
69EW3018	4/21/2004	ND	13.96	7.78	6.37	105	266	989
	7/12/2004	ND	13.31	4.94	5.41	102	156	221
	9/23/2004	ND	13.11	5.77	7.19	92	397	64
69EW3019	4/21/2004	<b>0.143</b>	11.84	4.85	6.04	64	106	12
	7/12/2004	<b>0.052</b>	13.00	4.01	6.46	65	91.7	19
	9/23/2004	0.010	13.13	2.92	6.31	68	401.1	32.8
	9/27/2005	ND	13.1	5.67	5.66	112	164.6	20.6
69EW3020	7/12/2004	<b>0.023</b>	12.89	6.42	6.00	65	190	40
	4/1/2005	0.017	11.63	3.82	5.33	70	226	25
69EW3021	4/21/2004	<b>0.194</b>	14.06	7.46	6.07	65	116	51
	7/12/2004	<b>0.045</b>	13.48	4.38	5.88	64	151	14
	9/23/2004	0.010	13.56	2.83	5.97	80	409	63
69EW3022	7/12/2004	<b>0.024</b>	13.84	4.93	5.39	63	181	2.8
	9/27/2005	ND	13.23	6.65	5.75	97	124	333
69EW3023	4/21/2004	<b>0.257</b>	12.23	8.23	6.86	63	105	13
	9/23/2004	<b>0.027</b>	13.28	2.67	5.84	72	421	6.2
69EW3024	7/12/2004	<b>0.080</b>	12.97	4.54	6.13	64	148	29
69EW3025	7/12/2004	<b>0.188</b>	13.27	3.04	6.24	74	57.3	33
	9/24/2004	<b>0.078</b>	15.09	2.12	5.69	74	302	11
69EW3026	4/21/2004	<b>0.288</b>	11.00	0.68	5.79	80	57.9	10
	7/12/2004	<b>0.169</b>	13.76	2.54	6.11	72	62.9	41
	9/24/2004	<b>0.057</b>	16.30	7.35	6.19	81	22.2	25
	9/27/2005	ND	13.43	4.97	6.19	101	104	183
69EW3027	7/12/2004	<b>0.121</b>	13.84	5.44	6.00	59	145	70
	9/24/2004	<b>0.038</b>	13.10	4.50	6.00	66	115	22
69EW3028	4/21/2004	<b>1.70</b>	11.58	3.31	5.93	71	101	8.0
	7/12/2004	<b>0.649</b>	13.18	4.25	5.87	67	62.7	68
	9/24/2004	<b>0.382</b>	14.12	3.04	6.06	70	65.8	16
69EW3029	7/12/2004	<b>0.767</b>	14.00	3.90	5.81	58	158	57
	9/24/2004	<b>0.863</b>	14.21	4.36	5.36	70	142	22
	4/1/2005	<b>0.516</b>	12.03	5.20	5.94	66	130	16
	9/27/2005	ND	14.02	4.72	6.02	110	70.7	711
69EW3030	4/21/2004	<b>1.47</b>	15.24	4.18	7.13	99	-7.20	127
	7/14/2004	<b>0.314</b>	12.61	1.94	5.98	81	142	71
	9/24/2004	<b>0.980</b>	14.91	4.40	6.81	86	326	1376
69EW3031	4/21/2004	ND	10.91	0.40	5.74	80	-3	10
	7/14/2004	<b>0.060</b>	13.52	1.54	6.06	75	21.2	26
	9/24/2004	<b>0.110</b>	14.03	2.13	5.75	72	286	7.1
	4/1/2005	<b>0.085</b>	11.12	2.02	5.60	75	103	4.4

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**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69EW3032	4/21/2004	0.604	12.39	5.95	6.22	70	55.7	19
	7/14/2004	0.553	13.45	7.03	6.31	67	96.7	58
69EW3033	4/21/2004	0.061	11.57	2.43	5.85	84	55.7	8.3
	9/24/2004	0.187	13.91	2.03	6.06	82	289	41
	9/27/2005	BRL	13.36	5.29	6.83	64	22.3	705
69EW3034	7/14/2004	0.033	13.57	0.66	6.32	85	20.5	85
	9/24/2004	0.139	13.78	0.86	6.27	81	186	103
69EW3035	4/21/2004	0.306	11.36	0.90	5.85	80	89.5	7.3
	7/14/2004	0.351	13.77	1.45	6.93	82	9.2	174
	10/1/2004	0.575	13.79	1.33	6.15	81	41.5	52
	4/1/2005	0.606	11.22	2.52	5.66	71	88.9	43
	9/27/2005	0.016	13.70	4.80	8.07	71	20.9	70
69EW3036	5/7/2004	0.296	14.20	6.62	6.66	80	74.3	377
	7/14/2004	0.320	12.60	1.96	5.96	81	142	0.2
	10/1/2004	0.337	12.79	2.20	5.90	79	145	84
69EW3037	5/7/2004	ND	12.43	1.20	5.53	80	68	50
	10/1/2004	ND	12.46	0.43	5.94	80	108	5.3
69EW3038	5/7/2004	1.23	24.56	7.60	6.10	0	106	55
	7/14/2004	0.571	12.56	3.04	6.53	82	253	4.3
	4/1/2005	0.027	11.10	0.99	5.95	84	80.1	5
69EW3039	5/7/2004	0.056	26.46	10.26	6.37	0	106	34
	7/14/2004	0.245	12.73	4.27	6.25	76	228	3.3
	10/1/2004	0.662	12.28	2.62	6.01	83	204	14
	4/1/2005	0.420	12.21	2.98	5.26	82	180	26
69EW3041	5/7/2004	ND	13.55	6.49	6.45	107	74.3	1372
	7/14/2004	ND	12.48	4.14	6.29	110	226	3.6
	10/1/2004	ND	12.31	3.85	6.30	110	218	8.8
69EW3043	5/7/2004	ND	13.05	8.78	6.11	91	120	1363
	7/14/2004	ND	12.08	7.64	6.36	95	256	3.5
69EW3045	5/7/2004	ND	13.88	6.73	6.54	95	72.3	1373
	7/15/2004	0.017	13.18	3.57	6.01	95	174	47
	10/1/2004	BRL	12.61	0.53	6.05	90	92.1	32
69EW3046	7/15/2004	0.826	12.98	2.54	5.84	81	205	3.6
69EW3047	5/7/2004	1.04	16.61	9.33	6.27	82	108	31
	7/15/2004	0.023	13.38	0.70	6.02	89	144	3.2
	9/27/2004	ND	12.65	0.33	5.49	79	236	0
69EW3048	5/7/2004	ND	11.30	1.21	6.16	85	67.3	8.7
	7/15/2004	ND	11.87	0.63	6.59	90	97.1	1.3
	9/27/2005	ND	12.28	0.43	5.69	85	310	10
69EW3049	5/7/2004	ND	13.78	6.21	5.60	81	108	32
	7/15/2004	0.026	11.99	0.91	6.21	85	138	26
	9/27/2004	ND	13.07	3.50	5.38	76	259	0
69EW3050	4/23/2004	ND	7.83	3.60	6.53	87	479	41
	7/15/2004	ND	12.54	0.98	5.55	84	201	7.7
	9/27/2004	ND	13.84	3.76	5.57	76	228	0.2
	4/1/2005	ND	24.88	4.13	6.03	97	72.9	2
69EW3051	4/23/2004	0.179	9.27	3.82	6.38	90	449	162
	7/15/2004	0.243	12.94	1.39	6.00	92	178	0.6
	9/27/2004	ND	13.62	4.20	5.55	80	229	0
	9/27/2005	BRL	12.84	7.12	6.38	112	120	36



**Table 3-3**  
**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69EW3052	9/27/2004	ND	13.50	0.22	5.79	87	177.5	0
69EW3053	4/23/2004	ND	10.19	3.58	5.72	84	416.3	210.1
69EW3054	4/23/2004	ND	10.46	2.87	5.69	85	428	197
	9/27/2004	ND	13.78	2.02	6.11	91	157	933
69EW3055	4/23/2004	ND	7.65	3.05	6.15	77	452	141
	7/15/2004	ND	13.75	0.48	5.77	82	114	11
69EW3056	4/23/2004	ND	7.25	3.58	5.41	93	370	26
	9/27/2004	ND	15.05	3.06	5.47	84	198	32
69EW3057	9/27/2004	ND	14.65	4.82	5.32	75	151	0
69EW3060	4/23/2004	ND	8.48	3.38	5.63	85	445	20
69EW3061	5/7/2004	ND	8.13	2.09	6.40	79	175	30
	7/15/2004	ND	13.57	0.48	5.61	83	134	2.4
	9/27/2004	ND	15.20	0.76	5.53	107	219	0
69EW3065	9/27/2004	ND	15.00	3.26	5.35	88	135	4.3
69EW3066	7/15/2004	ND	14.04	0.41	5.66	80	112	1.6
69EW3078	5/7/2004	ND	7.49	0.67	5.45	96	134	1.1
	7/15/2004	ND	13.65	0.53	5.72	85	59.9	0.6
69EW3080	9/27/2004	ND	15.17	2.75	5.45	88	159	14
69EW3081	5/7/2004	ND	9.16	7.16	5.30	109	232	672
69EW3081	7/15/2004	ND	13.79	1.79	5.61	94	134	9
69EW3082	9/27/2004	ND	14.10	5.29	5.41	75	188	7.6
69EW3088	9/27/2004	ND	15.02	0.51	5.63	85	155	0.9
69EW3097	5/7/2004	ND	9.57	6.55	5.64	91	51.1	2.5
69EW3103	7/15/2004	ND	13.34	0.86	6.14	75	94.8	9.0
69EW3106	9/27/2004	ND	13.90	1.00	5.43	64	156	0.6
69EW3127	7/22/2004	ND	12.74	1.28	6.72	69	-8.1	7.8
69EW3128	4/23/2004	ND	8.70	3.98	6.36	74	113	1.6
69EW3131	9/27/2004	<b>0.022</b>	15.06	0.78	5.53	74	148	6.0
	4/1/2005	ND	7.61	2.64	5.68	89	137	96
69EW3136	9/27/2004	ND	14.96	0.42	5.69	72	109	8.3
69EW3144	4/23/2004	ND	6.60	0.33	5.63	88	109	3.2
	7/22/2004	ND	13.36	0.31	5.27	83	192.4	0.2
	9/27/2004	ND	15.20	0.65	5.64	87	113	3.0
69EW3154	9/27/2004	ND	15.24	0.63	5.77	88	56.6	9.6
69EW3156	4/23/2004	ND	7.82	0.43	5.79	87	76.3	-0.9
69EW3168	7/22/2004	ND	12.98	0.49	5.29	83	187	0
	10/1/2004	ND	14.58	0.42	5.51	85	421	0.7
69EW3169	5/7/2004	BRL	8.72	0.76	5.57	91	91.2	198
69EW3170	10/1/2004	ND	14.72	3.12	5.43	76	336	0.6
69EW3171	4/23/2004	<b>0.054</b>	10.22	8.28	6.19	91	88.5	2.5
	7/22/2004	0.016	12.96	5.16	5.58	88	396	0.2
	10/1/2004	ND	12.81	5.41	5.83	83	441	2.1
69EW3172	10/1/2004	BRL	13.42	2.94	5.94	81	446	60
69EW3173	5/7/2004	ND	11.10	0.81	5.67	76	135	29
	7/22/2004	ND	14.09	0.31	5.34	71	142	0.3
69EW3177	10/1/2004	ND	14.08	0.21	5.81	77	105	0.8
69EW3180	4/23/2004	<b>0.052</b>	10.16	4.46	6.16	85	163	5.4
	7/22/2004	<b>0.100</b>	12.47	1.89	5.27	83	383	1.5
	4/1/2005	<b>0.160</b>	10.00	2.59	6.17	107	87.5	28

**Table 3-3**  
**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69EW3181	4/23/2004	0.140	9.52	0.73	5.59	80	217	-1.3
	10/1/2004	0.101	14.12	1.71	6.09	87	466	2.0
	9/27/2005	0.089	12.85	2.64	5.99	91	144	58
69EW3182	10/1/2004	ND	14.08	0.60	6.17	98	25.4	206
69EW3183	4/23/2004	ND	9.94	0.42	5.82	77	77.2	18
69EW3183	7/22/2004	ND	14.63	0.24	5.51	78	67.3	5.3
69EW3185	7/26/2004	ND	14.35	0.47	5.58	80	29.0	0.3
69EW3187	10/1/2004	ND	14.36	0.34	6.17	78	-70.6	2.9
69EW3188	5/7/2004	ND	13.13	5.85	5.79	84	83.7	57
69EW3190	5/7/2004	0.141	10.83	0.88	5.50	79	161	5.0
	7/26/2004	ND	14.07	0.40	5.73	75	141	1.0
69EW3192	7/26/2004	BRL	14.23	0.45	5.46	83	112	3.6
	10/1/2004	0.034	14.09	0.57	5.92	90	93.1	10
69EW3195	7/26/2004	ND	14.12	9.20	5.53	75	41.7	0.5
69EW3198	7/26/2004	ND	13.63	5.43	5.37	72	115	2.0
69EW3199	10/1/2004	0.037	14.25	7.40	6.15	83	212	64
	9/27/2005	ND	13.09	1.89	5.43	86	277	64
69EW3200	5/7/2004	0.033	11.31	0.80	5.28	76	174	5.5
	7/26/2004	BRL	12.80	0.55	5.17	75	175	0.4
69EW3201	5/7/2004	0.032	11.06	1.15	5.40	87	192	25
	7/26/2004	0.117	14.40	2.17	5.52	91	161	5.7
	4/1/2005	0.391	11.55	4.24	6.07	107	105	239
69EW3203	10/1/2004	ND	13.28	0.41	5.96	83	79.1	5.0
69EW3204	5/7/2004	ND	12.32	0.49	5.54	86	159	2.0
69IG0001	7/14/2004	ND	12.47	3.04	6.19	44	130	16
	4/27/2005	ND	11.90	7.20	6.06	87	148	0.7
69IG0002	4/15/2004	ND	12.10	4.39	5.58	82	359	0.7
	5/24/2004	ND	11.63	7.76	6.27	86	220	12
	7/14/2004	ND	12.11	3.08	6.02	87	93.8	3.7
	8/27/2004	ND	13.95	3.87	6.27	90	45.1	11
	4/27/2005	ND	12.04	3.85	5.79	82	137	1.0
	5/27/2005	ND	13.20	4.22	6.03	93	171	1.2
	6/29/2005	ND	15.38	4.93	5.93	95	222	6.0
	7/18/2005	ND	17.34	4.43	5.93	90	114	0.5
	8/16/2005	ND	13.25	5.65	6.20	87	104	-0.4
	9/16/2005	ND	14.20	4.40	5.97	84	309	3.3
	11/4/2005	ND	12.99	3.04	6.39	80	-273	119
69IG0012	7/21/2005	ND	13.55	2.23	6.69	102	-19.8	0.1
69IG0013	6/29/2005	ND	15.82	6.39	6.18	82	155	5.9
	10/5/2005	ND	14.96	1.42	6.53	73	82.4	1.2
69MW1271	5/26/2004	BRL	12.82	3.33	5.66	80	335	8.7
	4/5/2005	BRL	13.93	3.47	6.26	88	163	12
69MW1272	5/24/2004	0.016	11.78	6.72	5.77	80	259.4	2.4
	4/7/2005	0.019	11.91	8.52	5.77	78	275.7	1.1
69MW1275	5/24/2004	0.012	11.63	6.09	6.14	107	287	4.8
	4/5/2005	0.014	10.99	5.65	6.01	105	228	3.8
69MW1278	5/21/2004	0.059	13.34	8.43	5.41	78	389	8.9
	4/5/2005	0.025	12.20	8.80	5.79	83	259	4.7

**Table 3-3**  
**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69MW1279B	4/15/2004	ND	11.97	10.02	5.79	73	425	0.3
	5/18/2004	ND	12.57	9.27	5.53	70	408	0.2
	6/15/2004	ND	12.89	9.80	5.84	71	252	0
	7/16/2004	ND	14.31	9.20	5.43	67	392	0.6
	8/17/2004	ND	13.14	9.57	5.63	71	437	0.1
	9/15/2004	ND	13.82	8.20	5.87	70	252	1.2
	10/21/2004	ND	12.53	8.40	5.78	74	481	0
	11/16/2004	ND	12.78	8.78	5.96	74	155	1.0
	12/17/2004	ND	12.54	9.34	5.92	74	234	2.7
	1/19/2005	ND	11.56	9.05	5.67	83	236	0
	2/15/2005	ND	12.08	9.06	5.83	78	249	-0.6
	3/16/2005	ND	12.12	9.01	5.77	86	190	0.9
	4/25/2005	ND	12.68	8.87	5.98	73	233	1.9
	5/17/2005	ND	12.52	9.26	6.02	70	185	0.6
	6/16/2005	ND	13.59	8.35	5.64	80	249	0.6
	7/19/2005	ND	14.93	7.59	5.77	86	209	1.3
	10/31/2005	ND	12.98	8.63	5.91	93	261	2.4
69MW1279C	4/15/2004	<b>0.021</b>	11.63	7.36	6.33	81	368	1.5
	5/18/2004	0.018	13.12	7.68	5.95	77	390	1.3
	6/15/2004	0.018	12.50	7.11	6.23	78	200	1.4
	7/16/2004	0.018	13.36	6.99	5.78	74	379	5.3
	8/17/2004	<b>0.036</b>	12.15	7.06	5.99	77	423	2.3
	9/15/2004	0.017	12.37	6.32	6.25	75	223	7.8
	10/21/2004	0.016	12.53	6.71	6.15	77	457	2.3
	11/16/2004	0.018	12.34	6.68	6.26	76	145	3.1
	12/17/2004	0.017	12.07	7.19	6.34	76	202	1.6
	1/19/2005	0.016	11.55	6.81	6.09	86	180	2.6
	2/15/2005	0.017	12.03	7.16	6.27	80	210	0.2
	3/16/2005	0.016	12.10	7.52	6.35	87	158	6.9
	4/25/2005	0.015	12.36	6.92	6.07	78	200	1.5
	5/17/2005	0.016	12.77	7.04	6.28	75	154	1.9
	6/16/2005	0.015	12.73	6.77	6.00	83	197	1.2
	7/19/2005	0.014	14.67	6.79	6.27	85	198	2.2
	10/31/2005	0.012	12.42	7.08	6.29	95	243	1.4
69MW1283A	4/22/2004	<b>1.32</b>	12.61	5.53	5.83	81	314	0.4
	3/29/2005	<b>0.996</b>	11.84	5.21	5.97	77	192	-0.2
69MW1283B	4/22/2004	<b>1.15</b>	12.38	5.32	5.90	98	169	3.7
	3/29/2005	<b>0.707</b>	11.80	6.48	5.98	94	125	0.5
69MW1284A	4/22/2004	<b>2.94</b>	12.72	5.69	6.42	91	274	0.4
	7/7/2004	<b>2.37</b>	14.40	5.22	5.80	88	387	1.2
	9/10/2004	<b>2.47</b>	13.72	5.38	6.41	91	273	1.1
	3/29/2005	<b>2.65</b>	11.85	5.09	6.23	88	181	-0.2
	9/9/2005	<b>2.32</b>	13.64	4.27	6.34	92	388	0.4
69MW1284B	4/22/2004	<b>3.84</b>	12.36	3.62	6.36	84	152	0.6
	7/7/2004	<b>3.65</b>	14.27	3.48	5.88	81	353	1.5
	9/10/2004	<b>3.64</b>	13.17	3.18	6.47	84	239	1.1
	3/29/2005	<b>3.43</b>	11.81	3.08	6.29	82	97.7	-0.1
	9/9/2005	<b>2.98</b>	14.41	2.92	6.07	85	445	0.4

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**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69MW1285A	5/12/2004	0.399	14.40	3.69	5.78	75	207	0
	7/6/2004	0.212	15.18	3.22	5.50	67	237	0.6
	9/13/2004	0.132	14.42	3.06	6.08	67	392	-0.3
	3/30/2005	0.045	13.20	4.27	6.17	68	185	0
	9/9/2005	0.016	14.59	1.99	5.96	69	412	0
69MW1285B	5/12/2004	BRL	14.09	0.44	5.92	224	188	0
	7/6/2004	BRL	14.97	0.41	5.68	213	208	0.5
	9/13/2004	ND	13.65	0.42	6.14	174	366	-0.4
	3/30/2005	ND	12.16	0.55	6.30	121	133	0.2
	9/9/2005	BRL	14.35	0.41	5.93	100	420	0
69MW1286	4/21/2004	ND	12.23	0.36	6.40	100	139	2.3
	7/7/2004	ND	14.53	0.49	5.89	98	359	2.4
	9/13/2004	ND	14.25	0.60	6.36	100	304	1.2
	3/30/2005	ND	11.69	0.27	6.51	103	52.2	0.4
	9/12/2005	ND	14.19	0.30	6.51	128	104	0.6
69MW1291A	5/12/2004	ND	13.91	0.37	6.53	101	48.4	2.6
	7/1/2004	ND	14.30	0.55	6.37	104	80.7	3.0
	9/13/2004	ND	14.03	0.26	6.57	114	-57.6	38.5
	3/30/2005	ND	11.72	0.73	6.65	113	68.3	3.0
	9/12/2005	ND	13.66	0.18	6.60	140	60.5	12
69MW1294	5/12/2004	0.019	15.73	0.49	6.18	103	180	0.6
	7/6/2004	BRL	19.69	0.78	5.87	90	197	0.7
	9/29/2004	ND	13.90	0.27	6.47	94	127	2.0
	4/4/2005	0.017	11.65	0.32	6.42	108	145	2.2
	9/12/2005	BRL	16.46	0.62	6.43	117	157	0.9
69MW1296A	5/28/2004	ND	12.31	3.83	6.52	75	187	-0.2
	7/13/2004	ND	13.03	3.56	6.20	74	185	0.7
	9/13/2004	ND	13.22	7.16	6.35	82	356	-0.2
	4/6/2005	ND	11.99	2.67	6.47	77	193	0.1
	9/12/2005	ND	13.32	2.39	6.48	94	117	0.3
69MW1297	9/21/2004	ND	13.71	4.08	6.41	75	139	6.1
	4/4/2005	ND	12.89	5.08	6.46	77	154	9.9
69MW1298	9/21/2004	ND	13.72	9.07	6.53	95	164	3.7
	4/4/2005	ND	12.35	9.42	6.52	97	150	3.1
69MW1300A	4/21/2004	ND	13.41	0.15	5.39	83	-35.3	1.7
	7/13/2004	ND	14.52	0.35	5.53	74	152	0.4
	9/21/2004	BRL	15.01	1.16	5.62	74	224	4.9
	4/4/2005	0.195	12.66	2.20	5.74	60	230	8.5
	7/18/2005	0.336	17.73	2.29	5.66	70	198	4.1
	8/18/2005	0.208	14.97	2.01	5.15	67	437	2.0
	9/13/2005	0.162	16.99	2.23	5.24	91	214	3
69MW1300B	4/21/2004	BRL	12.32	0.21	6.14	99	-49.9	13
	7/13/2004	BRL	13.54	0.79	6.31	96	0.2	6.3
	9/21/2004	ND	14.61	0.96	6.26	90	6.9	12
	4/4/2005	BRL	12.44	1.28	6.37	91	28.0	9.2
	9/13/2005	BRL	16.32	1.56	6.33	107	103	12
69MW1301	10/3/2005	ND	15.77	1.40	5.68	79	188	169

**Table 3-3**  
**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69MW1302	4/21/2004	ND	12.63	6.71	6.29	97	188	1.7
	7/2/2004	ND	15.56	6.04	5.99	97	17	3.2
	9/29/2004	ND	13.92	5.73	6.64	95	126	3.6
	4/8/2005	ND	12.08	3.81	6.59	97	127	2.7
	8/19/2005	ND	15.35	5.94	6.30	94	362	1.3
	9/15/2005	ND	15.06	5.23	6.26	91	145	1.7
69MW1303A	5/12/2004	0.018	13.13	1.14	6.13	93	133	0.4
	7/1/2004	0.016	14.35	1.06	6.06	82	177	0.9
	9/29/2004	ND	13.54	0.90	6.28	85	123	1.3
	4/7/2005	BRL	13.15	0.46	6.08	113	194	0.1
	9/13/2005	BRL	16.08	0.66	6.05	168	173	1.7
69MW1303B	5/12/2004	BRL	13.21	0.83	6.22	90	61.8	4.3
	7/1/2004	BRL	14.67	0.88	5.88	79	103.4	5.7
	9/29/2004	ND	12.83	1.12	6.46	75	68.3	6.6
	4/7/2005	<b>0.022</b>	12.58	1.17	6.35	73	109	2.2
	9/13/2005	0.014	14.55	0.84	6.33	100	105	4.1
69MW1304	5/12/2004	<b>2.84</b>	13.20	5.51	6.23	84	276	0.7
	7/2/2004	<b>2.47</b>	13.96	5.35	5.89	96	25.7	3.0
	9/29/2004	<b>2.41</b>	12.97	5.24	6.27	87	158	5.1
	3/29/2005	<b>2.03</b>	11.56	5.37	6.04	88	201	0
	9/15/2005	<b>1.87</b>	14.64	5.82	6.01	87	171	0.7
69MW1305	5/28/2004	ND	12.99	9.03	6.25	120	235	4.9
69MW1305	7/29/2004	ND	15.70	8.22	6.07	128	231	12
69MW1306A	4/21/2004	0.015	12.02	5.20	6.40	67	264	0.3
	7/8/2004	<b>0.160</b>	14.83	5.34	5.96	67	197	1
	9/29/2004	<b>0.462</b>	13.17	3.30	6.30	73	203	0
	4/6/2005	<b>0.067</b>	12.81	4.57	6.37	75	209	0.4
	9/15/2005	<b>0.507</b>	14.73	1.37	5.90	81	176	0.2
69MW1306C	11/14/2005	BRL	11.98	5.76	7.27	100	4.30	32
69MW1308	8/18/2005	ND	14.70	6.21	6.40	82	194	11.6
69MW1310	5/21/2004	<b>2.87</b>	12.83	3.72	5.95	75	324	0.3
	4/5/2005	<b>1.14</b>	13.31	2.68	6.03	75	160	2.9
69MW1311	9/29/2004	ND	12.61	2.11	6.55	75	147	12
	4/6/2005	ND	12.68	2.08	6.59	79	172	14
69MW1312	9/30/2004	ND	14.04	5.72	6.40	163	232	2.6
	4/6/2005	ND	13.64	6.47	6.47	204	231	1.6
69MW1313	5/24/2004	ND	14.48	0.72	6.45	115	203	0.9
	7/8/2004	ND	15.30	1.11	6.06	116	175	0.8
	9/30/2004	ND	14.56	0.98	6.44	108	212	3.4
	4/6/2005	ND	14.29	0.95	6.46	141	165	-0.1
69MW1315	9/30/2004	<b>1.47</b>	12.64	3.39	6.43	94	203	10
	4/4/2005	<b>1.62</b>	10.83	3.63	6.32	92	147	-0.5
69MW1317A	4/22/2004	ND	13.30	0.86	5.89	85	243	1
	7/13/2004	ND	13.69	1.01	5.62	82	253	1.9
	9/10/2004	ND	14.17	0.66	5.99	89	274	2.1
	4/4/2005	ND	12.88	1.60	5.86	111	212	-0.2
	9/13/2005	ND	16.08	3.32	5.39	184	292	1.9

**Table 3-3**  
**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69MW1317B	4/22/2004	ND	12.80	2.49	5.58	66	249	0.4
	7/13/2004	BRL	13.80	2.06	5.36	63	237	5.2
	9/10/2004	ND	13.61	1.38	5.78	71	374	0.8
	4/4/2005	ND	13.29	0.73	5.62	103	208	1.1
	9/13/2005	ND	15.80	0.82	5.02	149	296	0.8
69MW1317C	8/16/2005	BRL	12.40	3.13	5.65	64	216	2.4
69MW1318A	5/24/2004	<b>0.965</b>	13.95	0.91	6.42	85	329	2.7
	7/21/2004	<b>0.576</b>	14.87	0.80	6.01	80	330	2.7
	9/29/2004	<b>0.291</b>	12.89	0.47	6.43	85	177	0
	4/4/2005	<b>0.160</b>	11.63	7.53	6.27	87	146	0
	9/16/2005	<b>0.209</b>	13.62	0.67	5.96	87	370	0.4
69MW1400A	5/24/2004	0.020	13.16	4.79	5.94	104	239	0.3
	4/6/2005	<b>0.017</b>	12.64	5.27	5.83	102	170	0
69MW1401	5/24/2004	<b>0.104</b>	12.27	5.25	6.19	110	193	4.5
	4/6/2005	<b>0.065</b>	12.62	5.80	6.11	103	121	0
69MW1403	5/24/2004	<b>0.089</b>	11.96	5.99	5.99	96	185	1.7
	4/6/2005	<b>0.073</b>	12.01	6.44	5.95	92	155	0.1
69MW1404	5/24/2004	ND	13.41	9.12	5.98	97	291	17
	4/5/2005	ND	13.48	9.13	5.99	99	230	13
69MW1411	5/24/2004	ND	12.73	2.22	6.16	84	181	11
	4/6/2005	0.010	12.07	6.90	6.14	94	-8.7	0.5
69MW1416	5/24/2004	0.011	13.90	8.99	6.03	87	250	2.4
	4/7/2005	0.018	13.50	8.97	5.96	84	178	-0.2
69MW1419	5/24/2004	0.017	11.62	8.02	6.11	78	231	1.0
	4/8/2005	BRL	10.78	8.53	6.10	88	176	1.8
69MW1501	4/15/2004	ND	14.34	0.10	5.17	81	300	-0.2
	5/18/2004	ND	16.33	1.57	5.36	77	349	2.0
	6/15/2004	ND	16.14	0.40	5.43	76	198	0.4
	7/29/2004	ND	18.00	0.75	5.32	75	201	1.3
	8/17/2004	ND	16.10	0.24	5.25	74	350	0.1
	9/30/2004	ND	16.44	0.70	5.49	75	179	0.4
	10/21/2004	ND	15.03	0.59	5.41	73	470	0
	4/4/2005	ND	13.30	0.59	5.39	73	181	-2.2
	4/27/2005	ND	14.46	0.23	5.25	75	182	1.2
	5/27/2005	ND	14.86	0.67	5.11	77	191	-0.2
	6/29/2005	ND	17.05	0.61	5.23	75	384	0.1
	7/18/2005	ND	16.83	0.38	5.41	75	188	0.4
	8/16/2005	ND	16.36	0.20	5.38	69	194	-0.2
	9/16/2005	ND	14.59	0.49	5.12	70	361	-0.4
	10/31/2005	ND	14.22	0.21	5.45	87	195	0
69PWS40960	4/16/2004	ND	12.58	5.97	6.72	90	133	0.4
	5/18/2004	ND	12.92	6.54	7.17	84	382	0.7
	6/15/2004	ND	12.99	6.10	7.10	91	157	0
	7/16/2004	ND	13.47	5.72	6.59	79	251	0.4
	8/17/2004	ND	13.57	4.11	6.70	85	439	-0.3
	9/15/2004	ND	12.62	4.71	5.93	81	164	0
	10/21/2004	ND	12.68	7.36	6.83	84	447	0.2
	11/16/2004	ND	11.91	5.59	6.39	81	184	0
	12/15/2004	ND	12.57	4.24	6.14	85	161	0.1
	1/19/2005	ND	12.63	5.08	6.02	94	158	0.5

**Table 3-3**  
**Groundwater EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB (µg/L) MMCL =0.02	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69PWS40960	2/15/2005	ND	13.38	5.66	5.95	100	159	4.9
	3/16/2005	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>
	4/25/2005	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>
	5/17/2005	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>
	6/16/2005	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>
	7/19/2005	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>	NS <sup>1</sup>
69PZ0100	8/16/2005	ND	12.83	0.41	6.08	83	12.2	15
69PZ0101	8/16/2005	ND	12.52	0.45	6.15	81	-13.4	67
69PZ1291A	5/12/2004	ND	10.45	4.89	5.55	70	221	6.2
	7/21/2004	ND	11.50	2.35	4.45	69	316	8.7
	9/13/2004	ND	13.21	1.36	5.75	77	47.9	37
69PZ1291B	5/12/2004	<b>0.368</b>	11.56	1.51	6.17	90	2.1	33
	7/21/2004	0.019	11.67	0.53	5.33	121	-81.3	8.4
	9/13/2004	0.011	11.98	0.55	6.31	120	-81.4	28
	3/30/2005	<b>0.046</b>	10.50	1.45	6.16	110	100	110
	9/12/2005	BRL	12.18	0.56	6.38	145	-4.7	688
69PZ1298A	8/18/2005	ND	12.69	0.64	5.04	80	251	106
69PZ1298B	8/19/2005	ND	14.03	9.94	5.64	87	385	494
69PZ1300A	8/18/2005	BRL	11.91	0.49	5.02	63	161	2.7
69PZ1300B	8/18/2005	ND	13.42	2.57	5.62	83	249	378
69PZ1301A	8/19/2005	ND	13.58	6.99	5.70	75	264	8.3
69PZ1301B	10/3/2005	ND	24.01	7.34	6.84	334	-98.7	190
69PZ1302A	8/19/2005	<b>0.027</b>	13.84	1.10	5.07	62	450	9.9
69PZ1302B	8/19/2005	ND	13.06	0.84	5.42	95	422	26
69PZ1308A	8/18/2005	ND	11.75	0.40	5.72	92	226	9.1
69PZ1308B	8/18/2005	ND	11.92	7.07	6.23	94	185	5.5
69PZ1309A	8/19/2005	ND	15.11	0.69	5.40	78	91.0	41
69PZ1309B	8/19/2005	ND	12.46	2.01	5.65	74	60.4	35
69PZ1318	5/24/2004	ND	12.19	2.41	5.18	83	387	8.9
	7/21/2004	ND	16.06	0.69	4.44	105	350	1.2
	9/29/2004	ND	15.83	2.15	5.09	98	322	5.6

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

The accuracy of the field parameter instrument readings is as follows: temperature (+/- 0.15%), specific conductance (+/- 0.5% of reading plus 1 µS/cm), dissolved oxygen (for instrument readings 0-20 mg/L, +/- 0.2 mg/L and for instrument readings 20-50 mg/L, +/- 0.6 mg/L), pH (+/- 0.2 units), oxidation-reduction potential (+/- 20 mV), turbidity (the greater of +/- 5% of reading or +/- 2 NTU).

**Bold** values represent EDB concentrations above the MMCL.

- 69PWS40960 was not sampled between March and July 2005 because the well was offline due to construction activities associated with connecting the well to the Crooked Pond treatment plant. 69PWS40960 was connected to the Crooked Pond treatment plant in August 2005 and is no longer sampled. Two sentry wells (69MW1279B and 69MW1279C) are sampled to monitor groundwater quality upgradient of 69PWS40960.

Key:

BRL = below reporting limit

mV = millivolts

SpC = specific conductance

°C = degrees Celsius

ND = not detected

std = standard units

DO = dissolved oxygen

NS = not sampled

Temp = temperature

EDB = ethylene dibromide

NTU = nephelometric turbidity units

µg/L = micrograms per liter

mg/L = milligrams per liter

ORP = oxidation-reduction potential

µS/cm = microsiemens per centimeter

MMCL = Massachusetts Maximum Contaminant Level

**Table 3-4**  
**Surface Water EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB <sup>1,2</sup> (µg/L)	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69SW0006	3/31/2005	ND	11.86	7.83	6.13	75	209	0.1
	4/28/2005	ND	13.02	10.66	6.67	82	187	1.6
	5/27/2005	ND	12.18	9.76	5.98	81	188	-0.1
	6/13/2005	ND	19.20	9.07	6.59	86	150	0.2
	7/28/2005	ND	18.88	7.05	6.17	88	144	0.7
	8/24/2005	ND	15.52	7.84	6.14	90	170	0
	9/26/2005	ND	14.40	7.54	6.16	64	165	-0.3
	10/27/2005	ND	12.02	9.22	6.07	76	301	0.9
69SW0008	3/31/2005	ND	8.45	2.63	5.56	78	241	15
	4/28/2005	ND	10.87	3.54	5.76	79	225	1.4
	5/27/2005	ND	12.09	10.13	5.82	77	180	4.2
	6/13/2005	ND	13.76	8.33	6.07	80	132	30
	7/28/2005	ND	15.07	3.33	6.04	78	168	3.4
	8/24/2005	ND	15.05	1.18	5.48	82	184	13
	9/26/2005	ND	15.62	1.27	5.89	84	175	22
	10/27/2005	ND	12.91	1.89	5.82	67	314	7.8
69SW0010	3/31/2005	ND	12.13	8.45	6.19	78	186	0.2
	4/28/2005	ND	12.69	10.64	6.58	88	166	0.1
	5/27/2005	ND	12.06	9.75	5.70	82	200	0.6
	6/13/2005	ND	17.80	8.56	6.39	86	151	0.3
	7/28/2005	ND	17.26	7.68	6.21	88	116	0.5
	8/24/2005	ND	15.87	9.40	6.42	91	133	0.2
	9/26/2005	ND	14.37	9.26	6.15	85	128	0.2
	10/27/2005	ND	11.87	9.55	6.11	82	273	0.5
69SW0011	3/31/2005	ND	12.74	9.11	6.07	75	196	0.6
	4/28/2005	ND	12.93	9.83	6.59	82	166	0.9
	5/27/2005	ND	12.24	10.23	5.85	82	180	-0.1
	6/13/2005	ND	19.43	9.33	6.40	86	138	0.4
	7/28/2005	ND	19.16	7.62	5.91	86	155	0.8
	8/24/2005	ND	16.66	9.17	6.07	90	151	0.3
	9/26/2005	ND	15.24	10.00	5.84	84	163	-0.3
	10/27/2005	ND	12.34	10.43	5.91	81	295	0.5
69SW0014	3/31/2005	ND	11.40	8.37	6.38	87	168	0.9
	4/28/2005	ND	12.45	8.98	6.55	90	190	0.3
	5/27/2005	ND	11.16	8.46	5.74	82	194	1.3
	6/13/2005	ND	15.03	0.92	6.17	96	85.4	4.1
	7/28/2005	ND	16.03	1.83	6.21	96	96.8	4.1
	8/24/2005	ND	17.33	5.54	6.12	92	139	3.0
	9/26/2005	ND	14.80	2.16	6.25	87	113	3.6
	10/27/2005	ND	9.64	4.59	6.17	78	261	2.5
69SW0019	3/31/2005	ND	12.34	9.64	6.31	81	163	0.9
	4/28/2005	ND	12.24	9.20	6.65	83	168	0.3
	5/27/2005	ND	12.00	9.53	5.55	83	196	-0.1
	6/13/2005	ND	18.07	8.21	6.42	89	148	0.1
	7/28/2005	ND	17.80	7.51	6.12	90	109	1.4
	8/24/2005	ND	17.02	9.37	6.28	90	120	0.5
	9/26/2005	ND	14.94	8.84	6.36	84	68.4	0.2
	10/27/2005	ND	11.89	9.72	6.27	81	219	0.9
69SW0024	3/31/2005	ND	12.17	10.24	6.32	80	179	1.7



**Table 3-4**  
**Surface Water EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB <sup>1,2</sup> (µg/L)	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
	6/13/2005	ND	18.52	9.09	6.47	88	157	1.1
	7/28/2005	ND	18.08	8.12	6.21	84	79.1	0.4
	8/24/2005	ND	17.15	9.83	6.33	89	107	0.5
	9/26/2005	ND	15.04	8.51	6.37	85	33.9	0
	10/27/2005	ND	9.98	8.97	6.17	82	164	1.3
69SW0046	3/31/2005	ND	10.54	9.58	6.28	79	171	0.5
	6/13/2005	ND	17.73	8.43	6.41	88	150	1.9
	7/28/2005	ND	17.74	7.58	6.00	89	104	0.5
	8/24/2005	ND	16.18	8.17	6.31	89	76	0.7
	9/26/2005	ND	14.58	7.22	5.99	85	175	0.2
	10/27/2005	ND	10.73	8.85	5.99	81	319	0.8
69SW0047	3/31/2005	ND	9.52	9.77	6.12	82	174	0.5
	7/28/2005	ND	17.56	6.67	6.29	91	47.2	0.5
	8/24/2005	ND	15.03	7.78	6.27	90	83.5	0.5
	9/26/2005	ND	14.39	6.88	6.37	87	118	0.8
	10/27/2005	ND	10.06	8.29	5.96	85	343	1.0
69SW0048	3/31/2005	ND	9.12	9.48	6.19	87	169	0.8
	7/28/2005	ND	17.60	7.47	7.02	91	139	0.5
	8/24/2005	ND	14.73	7.78	6.42	90	121	0.6
	9/26/2005	ND	14.48	8.41	6.73	86	173	0.3
	10/27/2005	ND	9.85	8.64	6.75	83	338	0.8
69SW0049	3/31/2005	ND	8.79	9.93	6.73	89	150	1.1
	9/26/2005	ND	14.09	7.99	7.17	91	119	0.2
	10/27/2005	ND	9.65	8.62	7.06	89	306	0.8
69SW0060	3/31/2005	ND	12.21	8.54	5.92	114	177	2.8
	6/13/2005	BRL	15.98	9.81	6.13	112	151	0.1
	6/20/2005	ND	21.15	8.94	6.36	115	242	1.0
	7/28/2005	ND	15.69	7.47	6.10	114	115	0.5
	8/24/2005	ND	16.08	8.40	5.83	100	141	3.2
	9/26/2005	ND	15.55	7.24	6.25	104	153	1.6
	10/27/2005	ND	9.23	7.62	5.81	96	322	0.9
	11/3/2005	ND	12.26	8.95	6.27	85	298	0.5
69SW2001	3/31/2005	ND	12.91	8.42	5.95	78	169	9.4
	6/13/2005	0.012	16.74	6.34	6.21	90	151	40
	6/20/2005	0.011	21.70	4.39	6.31	89	227	28
	7/28/2005	0.011	16.66	2.21	6.15	112	37.4	116
	8/24/2005	BRL	18.59	3.34	6.25	83	-2.60	179
	9/26/2005	BRL	15.91	4.16	6.13	85	165	1.3
	10/27/2005	BRL	11.72	6.74	5.74	84	331	1.7
	11/28/2005	ND	10.87	6.75	6.41	91	193	2.8
69SW2002	3/31/2005	ND	8.56	7.38	5.65	41	221.7	9.5
	6/13/2005	ND	21.26	2.22	6.21	102	168	1.8
	7/28/2005	ND	20.32	7.63	6.98	94	51.9	89
	8/24/2005	ND	17.48	4.56	5.98	436	76.8	25
	9/26/2005	ND	16.52	4.86	6.41	170	161	32
	10/27/2005	ND	7.26	7.53	5.81	78	380	12

**Table 3-4**  
**Surface Water EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB <sup>1,2</sup> (µg/L)	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69SW2003	3/31/2005	ND	3.20	2.40	5.62	41	198	29
	6/13/2005	ND	20.54	1.86	6.13	111	20.4	24
	7/28/2005	ND	21.31	2.13	6.38	265	-11.2	106
	8/24/2005	ND	17.66	0.57	6.05	195	-29.2	585
	9/26/2005	ND	15.14	6.50	6.17	169	124	54
	10/27/2005	ND	6.65	6.87	5.58	68	385	52
69SW2004	3/31/2005	ND	8.38	5.06	6.12	79	125	12
	6/13/2005	ND	15.84	4.15	6.38	105	57.5	80
	7/28/2005	ND	19.57	1.91	6.07	134	24.2	66
	8/24/2005	ND	17.40	2.37	5.86	109	52.9	124
	9/26/2005	ND	14.52	0.80	6.13	143	62.2	71
	10/27/2005	ND	9.96	1.52	6.02	139	206	173
69SW2005	3/31/2005	ND	7.49	3.52	6.07	84	102	31
	6/13/2005	ND	15.93	8.34	6.01	111	148	0.9
	7/28/2005	ND	21.85	7.45	6.04	116	68.3	29
	8/24/2005	ND	18.67	2.52	6.25	125	18.2	59
	9/26/2005	ND	16.76	3.26	6.31	99	130	27
	10/27/2005	ND	6.80	4.68	6.04	70	329	7.5
69SW2006	3/31/2005	ND	6.67	7.82	6.01	115	179	0.5
69SW2014	3/31/2005	ND	8.98	8.80	6.38	61	152	30
	6/13/2005	ND	17.51	9.86	6.25	89	49.9	2.6
	7/28/2005	ND	17.08	3.76	6.22	90	58.8	6.2
	8/24/2005	ND	16.66	3.84	6.17	115	36.0	22
	9/26/2005	ND	15.92	2.08	5.99	107	94	68
	10/27/2005	ND	7.31	6.28	6.02	96	323	8.8
69SW2018	3/31/2005	ND	13.08	7.82	6.08	76	192	0.4
	4/28/2005	ND	12.59	9.86	6.55	83	170	1.4
	5/27/2005	ND	12.04	10.00	5.67	82	193	0.2
	6/13/2005	ND	17.57	9.02	6.35	86	156	4.4
	7/28/2005	ND	15.17	8.92	5.92	94	148	0.1
	8/24/2005	ND	18.90	5.76	5.80	81	138	1.3
	9/26/2005	ND	15.33	7.00	6.05	80	149	0.5
	10/27/2005	ND	11.74	7.36	5.94	66	296	2.9
69SW4001 (depth = 0 ft bps)	7/7/2005	ND	15.82	7.96	6.43	109	287	2
69SW4001 (depth = 15 ft bps)	7/28/2005	ND	19.15	6.55	6.16	92	99.2	5.6
69SW4001 (depth = 0 ft bps)	8/24/2005	ND	19.33	6.31	5.88	113	102	3.3
69SW4002	7/21/2005	ND	23.67	4.24	6.43	99	39.3	17
69SW4003	8/24/2005	ND	16.23	1.75	5.79	84	81.2	119
69SW4004	8/24/2005	ND	16.50	1.27	6.04	102	20.3	102
69SW4005	8/24/2005	ND	15.89	5.89	5.97	83	103	1.6
69SW4006	8/24/2005	ND	15.13	5.21	5.99	83	151	0.7
69SWCP01	4/28/2005	ND	12.58	10.84	7.55	75	111	2.3
69SWCP01	7/5/2005	ND	23.73	9.19	7.39	86	79.2	4.7
69SWJP01	10/20/2005	ND	15.90	9.57	7.66	81	129	0.6

**Table 3-4**  
**Surface Water EDB Monitoring Results and Water Quality Parameters**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Date	Laboratory Analyses	Field Parameters					
		EDB <sup>1,2</sup> (µg/L)	Temp (°C)	DO (mg/L)	pH (std)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
69SWRP01	4/28/2005	ND	13.45	10.43	7.89	62	73.3	6.2
69SWRP01	7/5/2005	ND	25.06	8.76	7.47	75	71.7	0.8

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

The accuracy of the field parameter instrument readings is as follows: temperature (+/- 0.15%), specific conductance (+/- 0.5% of reading plus 1 µS/cm), dissolved oxygen (for instrument readings 0-20 mg/L, +/- 0.2 mg/L and for instrument readings 20-50 mg/L, +/- 0.6 mg/L), pH (+/- 0.2 units), oxidation-reduction potential (+/- 20 mV), turbidity (the greater of +/- 5% of reading or +/- 2 NTU).

**Bold** values represent EDB concentrations above the risk-based concentration or ecological benchmark.

1. EDB human health screening-level risk based concentration ( $10^{-3}$  risk) = 7.71 µg/L: *Final Fuel Spill-28 2002 Annual System Performance and Ecological Impact Monitoring Report*, dated March 2003.
2. EDB screening-level ecological benchmark = 31 µg/L: *Final Ethylene Dibromide Derivation of Aquatic Screening Benchmarks*, dated November 1998.

Key:

°C = degrees Celsius  
 BRL = below reporting limit  
 DO = dissolved oxygen  
 EDB = ethylene dibromide  
 ft bps = feet below pond surface  
 mg/L = milligrams per liter  
 mV = millivolts  
 ND = not detected

NS = not sampled  
 NTU = nephelometric turbidity units  
 ORP = oxidation-reduction potential  
 SpC = specific conductance  
 std = standard units  
 Temp = temperature  
 µg/L = micrograms per liter  
 µS/cm = microsiemens per centimeter

**Table 5-1**  
**Proposed Groundwater Chemical Monitoring Network**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Rationale for Location	Current Frequency	Proposed Frequency	Parameters
69IG0001	Monitor irrigation well for the Upper Baptiste Bog	M (Apr - Oct) (if used)	M (Apr - Oct) (if used)	EDB
69IG0002	Monitor irrigation well for the Lower Baptiste Bog	M (Apr - Oct)	M (Apr - Oct)	EDB
69MW0012A	Monitor the western plume boundary	None	SA	EDB
69MW0023	Monitor the western plume boundary	None	SA	EDB
69MW0025A	Monitor the leading edge of the deep uncaptured portion of the plume	None	SA	EDB
69MW0025B	Monitor the leading edge of the deep uncaptured portion of the plume	None	SA	EDB
69MW1271	Monitor the northern part of the plume	A	None	EDB
69MW1272	Monitor the northern part of the plume	A	A-2	EDB <sup>1</sup>
69MW1275	Monitor the northern part of the plume	A	A-2	EDB <sup>1</sup>
69MW1278	Monitor the plume between the western arm of Coonamessett Pond and Hatchville Road	A	A-2	EDB <sup>1</sup>
69MW1279B	CWSW sentry wells	Q	Q	EDB
69MW1279C	CWSW sentry wells	Q	Q	EDB
69MW1283A	Monitor the plume between the western arm of Coonamessett Pond and Hatchville Road	A	A	EDB <sup>1</sup>
69MW1283B	Monitor the plume between the western arm of Coonamessett Pond and Hatchville Road	A	A	EDB <sup>1</sup>
69MW1284A	Monitor the plume upgradient of 69EW0001	SA	A	EDB <sup>1</sup>
69MW1284B	Monitor the plume upgradient of 69EW0001	SA	A	EDB <sup>1</sup>
69MW1285A	Monitor the plume downgradient of 69EW0001 and upgradient of shallow wellpoint extraction wells	SA	SA	EDB
69MW1285B	Monitor the plume downgradient of 69EW0001 and upgradient of shallow wellpoint extraction wells	SA	SA	EDB
69MW1286	Monitor the uncaptured portion of the plume	SA	SA	EDB
69MW1291A	Monitor the plume in the vicinity of the shallow wellpoint extraction system	SA	SA	EDB
69MW1294	Monitor the plume downgradient of shallow well-points	SA	SA	EDB
69MW1296A	Monitor northern portion of the uncaptured southern portion of the plume	SA	SA	EDB
69MW1297	Monitor southwestern plume boundary	A	A	EDB
69MW1298	Monitor southeastern plume boundary	A	A	EDB
69MW1300A	Monitor the uncaptured portion of the plume	SA	SA	EDB
69MW1300B	Monitor the uncaptured portion of the plume	SA	SA	EDB
69MW1302	Monitor the uncaptured portion of the plume	SA	SA	EDB
69MW1303A	Monitor the plume downgradient of 69EW0001	SA	A	EDB <sup>1</sup>
69MW1303B	Monitor the plume downgradient of 69EW0001	SA	A	EDB <sup>1</sup>
69MW1304	Monitor the plume upgradient of 69EW0001	SA	A	EDB <sup>1</sup>
69MW1306A	Monitor the uncaptured portion of the plume	SA	SA	EDB
69MW1306C	Monitor the uncaptured portion of the plume	SA	SA	EDB
69MW1310	Monitor plume between the western arm of Coonamessett Pond and Hatchville Road	A	A	EDB <sup>1</sup>
69MW1311	Monitor western plume boundary near the treatment plant	A	A-2	EDB <sup>1</sup>
69MW1312	Monitoring eastern plume boundary near Hatchville Road	A	A-2	EDB <sup>1</sup>

**Table 5-1**  
**Proposed Groundwater Chemical Monitoring Network**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Rationale for Location	Current Frequency	Proposed Frequency	Parameters
69MW1313	Monitor eastern plume boundary near between Coonamessett Pond and Hatchville Road	A	A-2	EDB <sup>1</sup>
69MW1315	Monitor western plume boundary north of Hatchville Road	A	A-2	EDB <sup>1</sup>
69MW1316	Monitor western plume boundary north of Hatchville Road	None	A-2	EDB <sup>1</sup>
69MW1317A	Monitor the plume downgradient of 69EW0001 and upgradient of shallow wellpoint extraction wells	SA	SA	EDB
69MW1317B	Monitor the plume downgradient of 69EW0001 and upgradient of shallow wellpoint extraction wells	SA	SA	EDB
69MW1317C	Monitor the plume downgradient of 69EW0001 and upgradient of shallow wellpoint extraction wells	SA	SA	EDB
69MW1318A	Monitor northern portion of the uncaptured southern portion of the plume	SA	SA	EDB
69MW1400A	Monitor the northern part of the plume	A	A-2	EDB <sup>1</sup>
69MW1401	Monitor the northern part of the plume	A	A-2	EDB <sup>1</sup>
69MW1403	Monitor the northern part of the plume	A	A-2	EDB <sup>1</sup>
69MW1404	Monitor the northern part of the plume	A	A-2	EDB <sup>1</sup>
69MW1411	Monitor the northern part of the plume	A	A-2	EDB <sup>1</sup>
69MW1416	Monitor the northern part of the plume	A	A-2	EDB <sup>1</sup>
69MW1419	Monitor the northern part of the plume	A	None	EDB
69MW1501	Sentry well for Coonamessett Farm's irrigation well	M (Mar - Oct)	April, June, August and October	EDB
69PZ0005B	Monitor the uncaptured portion of the plume	None	SA	EDB
69PZ0017A	Monitor the uncaptured portion of the plume	None	SA	EDB
69PZ0019B	Monitor the uncaptured portion of the plume	None	SA	EDB
69PZ1291B	Monitor the plume in the vicinity of the shallow wellpoint extraction system	SA	SA	EDB
69PZ1298A	Monitor the uncaptured portion of the plume	None	SA	EDB
69PZ1300A	Monitor the uncaptured portion of the plume	SA	SA	EDB
69PZ1302A	Monitor the uncaptured portion of the plume	SA	SA	EDB
69PZ1308A	Monitor the uncaptured portion of the plume	None	SA	EDB
SWP <sup>2</sup>	Define footprint of plume discharge zone	SA	SA	EDB

Data Source: AFCEE, April 2006, MMR-AFCEE Data Warehouse

Notes:

1. Diffusion sample
2. Ten shallow wellpoints are sampled semiannually.

Key:

A = annually

A-2 = every two years

CWSW = Coonamessett Water Supply Well

EDB = ethylene dibromide

M = monthly

Q = quarterly

SA = semiannually

SWP = shallow wellpoint

**Table 5-2**  
**Proposed Surface Water Chemical Monitoring Network**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location Identification	Rationale for Location	Current Frequency	Proposed Frequency	Parameters
69SW0006	Monitor surface water flowing into the upper Baptiste Bog	Monthly	Monthly	EDB
69SW0008	Monitor surface water flowing into the upper Baptiste Bog	Monthly	Monthly	EDB
69SW0010	Monitor surface water downstream of Bubbler #1	Monthly	Monthly	EDB
69SW0011	Monitor surface water flowing out of the Upper Baptiste bog	Monthly	Monthly	EDB
69SW0014	Monitor surface water in the Broad River	Monthly	Monthly	EDB
69SW0019	Monitor surface water in the Coonamessett River adjacent to the shallow wellpoint extraction system	Monthly	Monthly	EDB
69SW0024	Monitor surface water downgradient of the shallow wellpoint extraction system	Monthly	Monthly	EDB
69SW0046	Monitor surface water flowing out of the Adams bog	Monthly	Monthly	EDB
69SW0047	Monitor surface water flowing into the East Thompson bog	Monthly	Monthly	EDB
69SW0048	Monitor surface water flowing out of the East Thompson bog	Monthly	Monthly	EDB
69SW0049	Monitor surface water flowing south of Sandwich Road	Annually	Monthly	EDB
69SW0051	Monitor surface water flowing out of the Reservoir bog	None	Annually	EDB
69SW0052	Monitor surface water flowing out of the Middle bogs	None	Annually	EDB
69SW0060	Monitor surface water flowing out of the Augusta bog	Monthly	Monthly	EDB
69SW0065	Monitor surface water immediately downstream of Bubbler #1	Quarterly	Quarterly	Water Quality Parameters
69SW2001	Monitor surface water flowing out into the Augusta bog	Monthly	Monthly	EDB
69SW2002	Monitor surface water flowing into the West Thompson bog	Monthly	Monthly	EDB
69SW2003	Monitor surface water flowing out of the West Thompson bog	Monthly	Monthly	EDB
69SW2004	Monitor surface water flowing into the Adams bog	Monthly	Monthly	EDB
69SW2005	Monitor surface water flowing out of the LaSalle bog	Monthly	Monthly	EDB
69SW2006	Monitor surface water flowing into the Chaston bog	Monthly	Monthly	EDB
69SW2007	Monitor surface water flowing out of the Chaston bog	Quarterly	Monthly	EDB
69SW2008	Monitor surface water flowing into the Reservoir bog	None	Annually	EDB
69SW2009	Monitor surface water flowing out of the Lower bog	None	Annually	EDB
69SW2014	Monitor surface water flowing into the LaSalle bog	Monthly	Monthly	EDB
69SW2018	Monitor surface water flowing out of the Upper Baptiste bog	Monthly	Monthly	EDB
69SWCP01	Coonamessett Pond recreational beach monitoring	April and July	April and July	EDB
69SWDP01	Deep Pond recreational beach monitoring	None	April and July	EDB
69SWJP01	Jenkins Pond recreational beach monitoring	October	April and July	EDB
69SWRP01	Round Pond recreational beach monitoring	April and July	April and July	EDB

Data Source: AFCEE, April 2006, MMR-AFCEE Data Warehouse

Note:

All samples will be collected during the cranberry growing season (March - October).

Key:

EDB = ethylene dibromide

Water Quality Parameters = temperature, dissolved oxygen, pH, oxidation-reduction potential, specific conductivity, and turbidity

**Table C-1**  
**Estimates of Hydraulic Conductivity Calculated from Grain-Size Data**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Location	Depth Interval (ft bgs)		Depth Interval (ft msl)		Uniformity Coefficient (C <sub>u</sub> )	D <sub>10</sub> (mm)	Estimated Hydraulic Conductivity ft/day	Method	Silt/Clay Fraction
69BH2001	19.7	- 24.3	10.26	- 5.66	2.7	0.1911	132.9	Hazen	1.2
	35	- 40	-5.04	- -10.04	93.7	0.3182	107.7	Beyer	0.2
	69	- 74	-39.04	- -44.04	13.5	0.01	0.2	Beyer	19
	75	- 82	-45.04	- -52.04	na	na	na	na	79
	82	- 92	-52.04	- -62.04	2.3	0.075	19.2	Beyer	11
	104	- 112	-74.04	- -82.04	4.2	0.05	7.6	Beyer	19
	115	- 133	-85.04	- -103.04	2.9	0.1359	65.5	Hazen	3
	135	- 154	-105.04	- -124.04	5.5	0.0945	25.6	Beyer	6
	168	- 173	-138.04	- -143.04	2.5	0.0998	33.7	Beyer	3
	175	- 182	-145.04	- -152.04	5.0	0.1359	52.7	Hazen	4
	182	- 195	-152.04	- -165.04	2.5	0.1673	104.0	Hazen	0
	195	- 213	-165.04	- -183.04	3.7	0.1028	34.6	Hazen	5
69BH2000	3	- 5	22.14	- 20.14	3.1	0.2922	300.4	Hazen	0
	5	- 6	20.14	- 19.14	5.3	0.2984	247.4	Hazen	0
	6	- 12	19.14	- 13.14	2.8	0.2855	291.9	Hazen	1.5
	15	- 19	10.14	- 6.14	4.7	0.425	532.8	Hazen	0
	19	- 26	6.14	- -0.86	3.0	0.2	140.8	Hazen	3
	35	- 40	-9.86	- -14.86	18.4	0.3066	197.2	Beyer	1
	40	- 45.5	-14.86	- -20.36	3.1	0.209	152.2	Hazen	0.6
	55	- 64	-29.86	- -38.86	2.3	0.25	240.0	Hazen	0
	65	- 70	-39.86	- -44.86	1.4	0.028	2.5	Beyer	52

**Key:**

ft bgs = feet below ground surface

ft msl = feet mean sea level

ft/day = feet per day

D<sub>10</sub> = effective grain size

C<sub>u</sub> = uniformity coefficient

**Note:**

na = Not available. No estimate of hydraulic conductivity calculated for sample matrix with high silt content.



69BH2000



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## **ANALYTICAL REPORT**

2005/10 FS-28 Drilling

Lot #: D6A160207

Trudy Scott

CH2M Hill, Inc  
2525 Airpark Drive  
Redding, CA 96001

**STL DENVER**

  
**Karen Kuoppala**  
Project Manager

February 8, 2006

## Particle Size of Soils by ASTM D422\_MOD

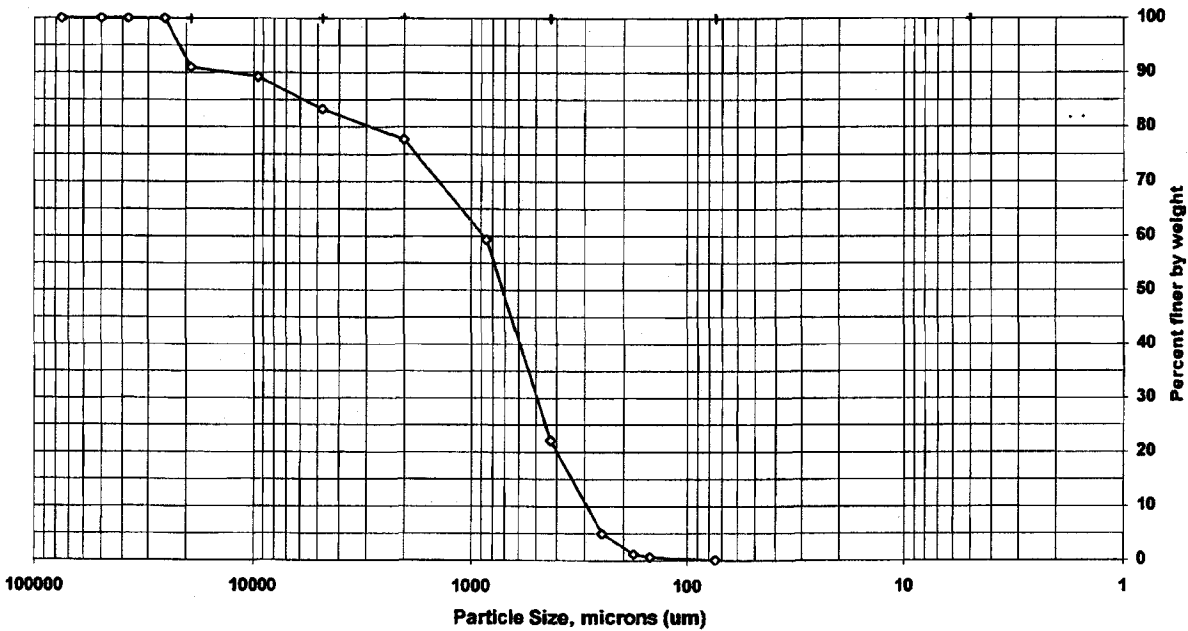
Client Code: STLCOD  
 Sample ID: CHPK00200A00105  
 Lab ID: 654682

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 95.2%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 25 mm

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	91.0	9.0
3/8 inch	9500	89.2	1.8
#4	4750	83.3	6.0
#10	2000	77.6	5.6
#20	850	59.4	18.2
#40	425	22.1	37.3
#60	250	4.9	17.2
#80	180	1.2	3.8
#100	150	0.6	0.5
#200	75	0.0	0.6
Hydrometer	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	16.7
Sand	83.2
Coarse Sand	5.6
Medium Sand	55.5
Fine Sand	22.1
Silt	0.0
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

# Particle Size of Soils by ASTM D422\_MOD

69BH2000

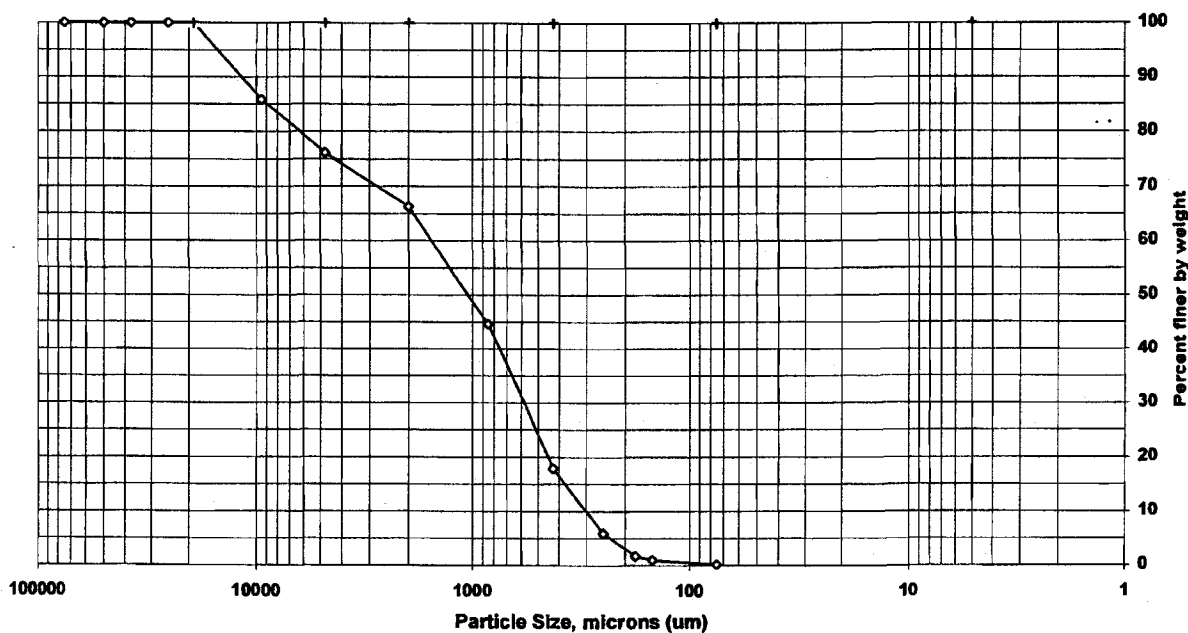
Client Code: STLCOD  
Sample ID: CHPK00200B00105  
Lab ID: 654683

SDG: 6A160207  
ETR(s): 112132

Date Received: 1/18/2006  
Start Date: 1/19/2006  
End Date: 2/2/2006

Percent Solids: 88.0%  
Specific Gravity: 2.650 (assumed)  
Maximum Particle Size: 19 mm

Non-soil material: na  
Shape (> #10): subangular  
Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	85.8	14.2
#4	4750	76.1	9.7
#10	2000	66.3	9.8
#20	850	44.6	21.7
#40	425	17.9	26.7
#60	250	5.9	11.9
#80	180	1.7	4.2
#100	150	1.0	0.7
#200	75	0.1	0.8
Hydrometer	0.0	0.0	0.1
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	23.9
Sand	75.9
Coarse Sand	9.8
Medium Sand	48.4
Fine Sand	17.7
Silt	0.1
Clay	0.0

Preparation Method: D2217  
Dispersion Device: Mechanical mixer with a metal paddle.  
Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

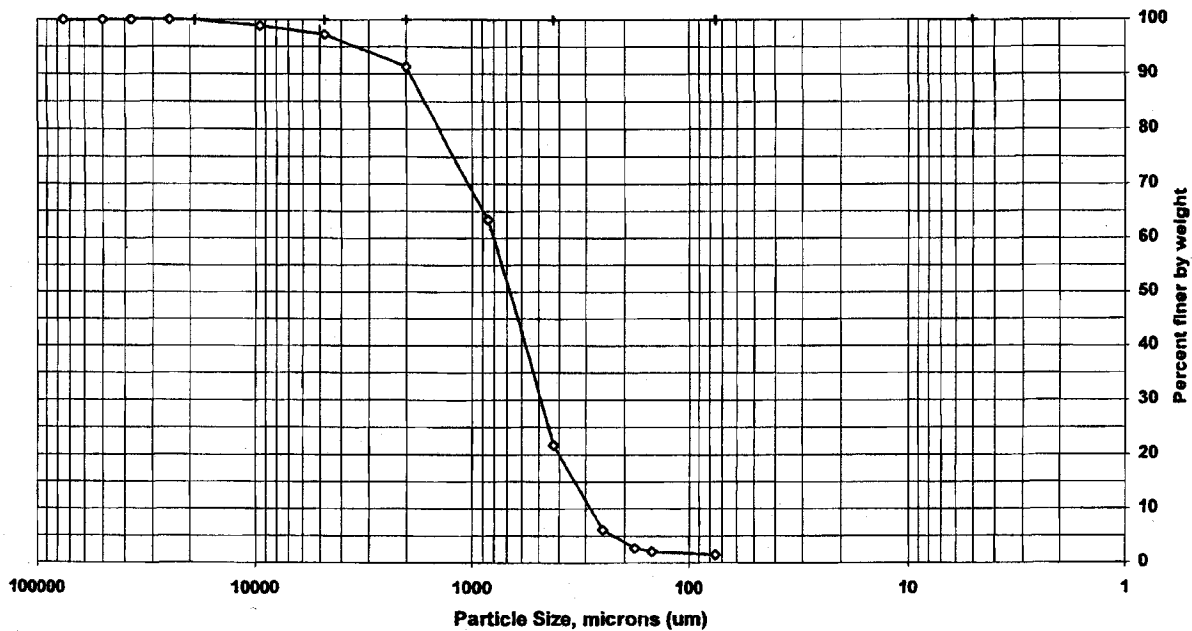
Client Code: STLCOD  
 Sample ID: CHPK00200C00105  
 Lab ID: 654684

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 89.5%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 19 mm

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	98.9	1.1
#4	4750	97.2	1.7
#10	2000	91.3	5.9
#20	850	63.4	27.9
#40	425	21.7	41.7
#60	250	6.1	15.6
#80	180	2.7	3.4
#100	150	2.1	0.6
#200	75	1.5	0.5
Hydrometer	0.0	0.0	1.5
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	2.8
Sand	95.7
Coarse Sand	5.9
Medium Sand	69.6
Fine Sand	20.2
Silt	1.5
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

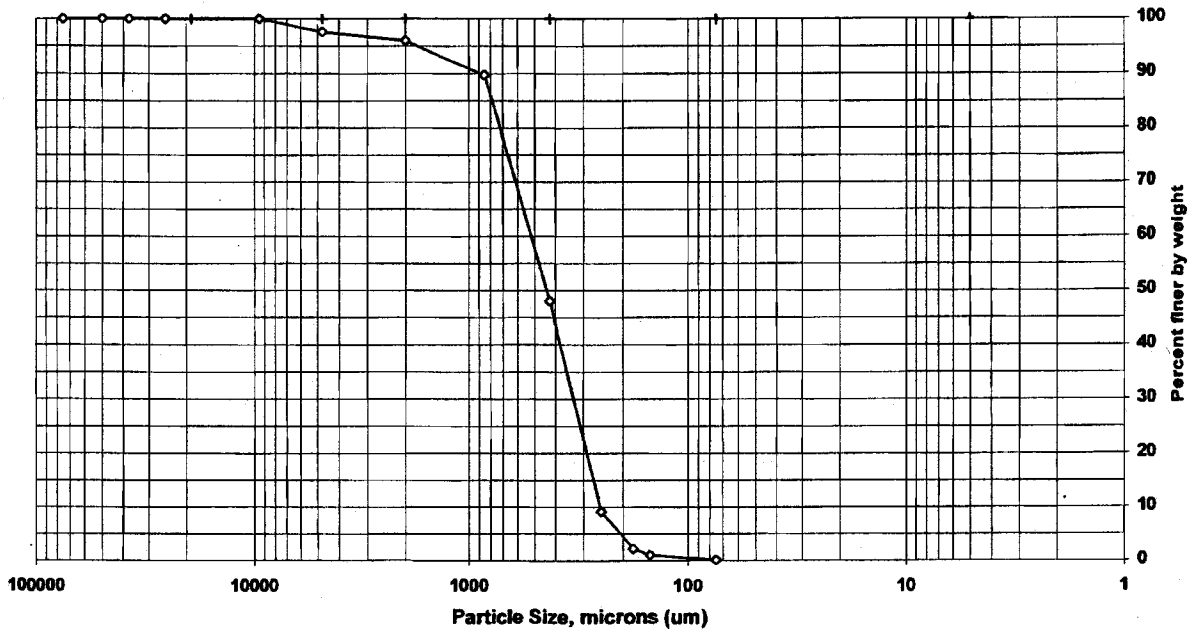
Client Code: STLCOD  
 Sample ID: CHPK00200D00105  
 Lab ID: 654685

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 85.2%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 9.5 mm

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	97.6	2.4
#10	2000	96.0	1.6
#20	850	89.8	6.2
#40	425	48.0	41.7
#60	250	9.1	38.9
#80	180	2.2	6.9
#100	150	1.0	1.2
#200	75	0.1	0.9
Hydrometer	0.0	0.0	0.1
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	2.4
Sand	97.4
Coarse Sand	1.6
Medium Sand	47.9
Fine Sand	47.9
Silt	0.1
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

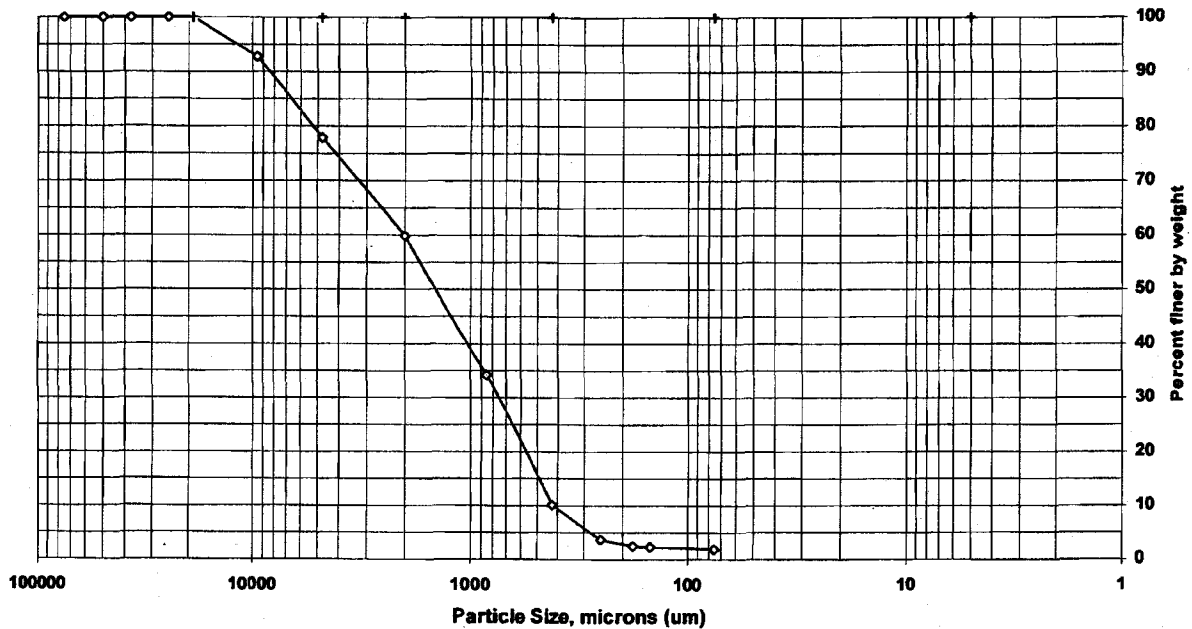
Client Code: STLCOD  
 Sample ID: CHPK00200E00105  
 Lab ID: 654686

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 91.0%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 19 mm

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	92.8	7.2
#4	4750	77.8	14.9
#10	2000	59.8	18.0
#20	850	34.3	25.6
#40	425	10.1	24.2
#60	250	3.6	6.4
#80	180	2.5	1.1
#100	150	2.3	0.2
#200	75	1.9	0.4
Hydrometer	0.0	0.0	1.9
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	22.2
Sand	75.9
Coarse Sand	18.0
Medium Sand	49.8
Fine Sand	8.2
Silt	1.9
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute



## Particle Size of Soils by ASTM D422\_MOD

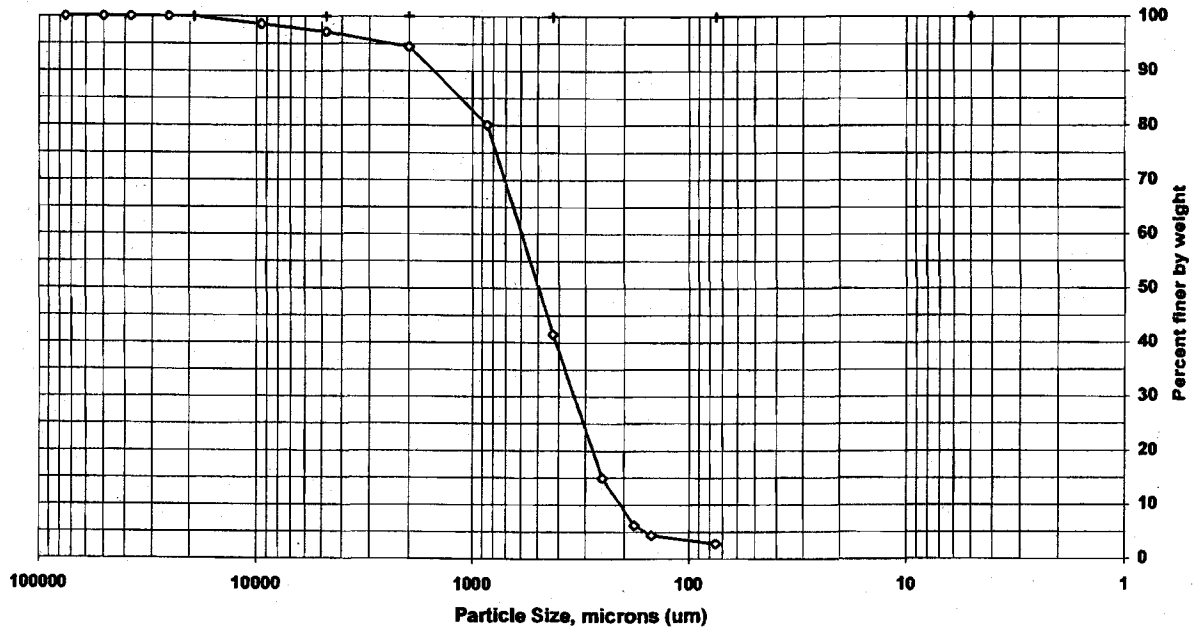
Client Code: STLCOD  
 Sample ID: CHPK00200F00105  
 Lab ID: 654687

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 86.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 19 mm

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	98.6	1.4
#4	4750	97.2	1.4
#10	2000	94.4	2.8
#20	850	80.1	14.3
#40	425	41.5	38.6
#60	250	14.9	26.6
#80	180	6.2	8.7
#100	150	4.4	1.9
#200	75	2.9	1.5
Hydrometer	0.0	0.0	2.9
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	2.8
Sand	94.3
Coarse Sand	2.8
Medium Sand	52.9
Fine Sand	38.6
Silt	2.9
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

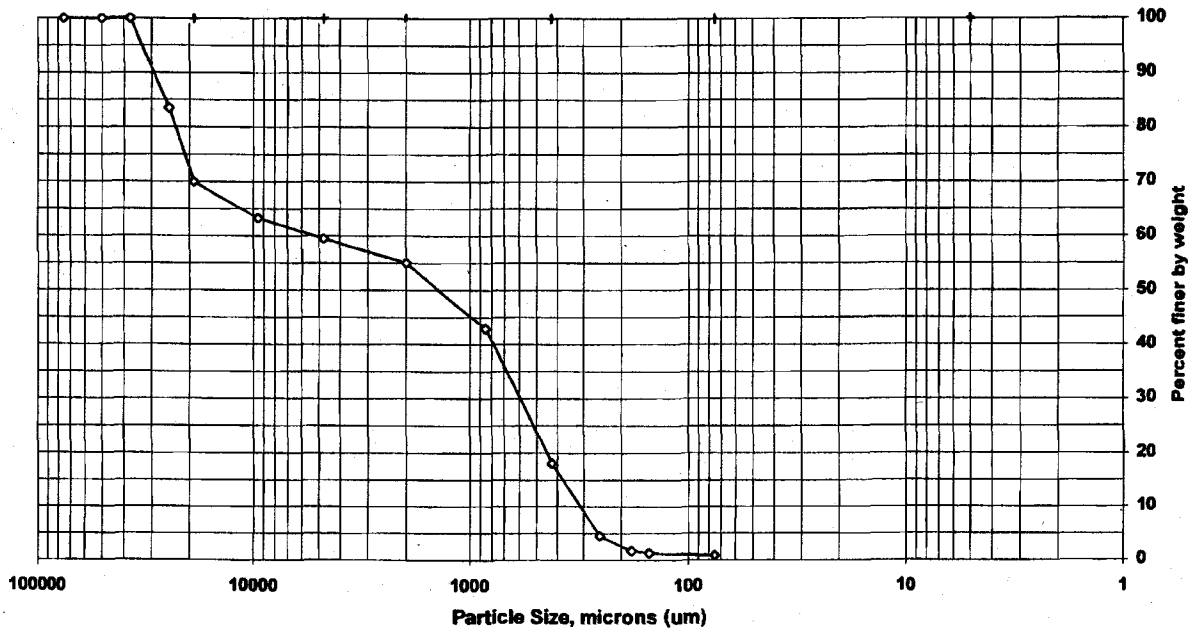
Client Code: STLCOD  
 Sample ID: CHPK00200G00105  
 Lab ID: 654688

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 87.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 37.5 mm

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	83.5	16.5
3/4 inch	19000	69.9	13.6
3/8 inch	9500	63.2	6.7
#4	4750	59.5	3.7
#10	2000	55.0	4.5
#20	850	42.9	12.1
#40	425	18.1	24.8
#60	250	4.5	13.6
#80	180	1.7	2.8
#100	150	1.3	0.4
#200	75	0.8	0.4
Hydrometer	0.0	0.0	0.8
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	40.5
Sand	58.7
Coarse Sand	4.5
Medium Sand	36.9
Fine Sand	17.3
Silt	0.8
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

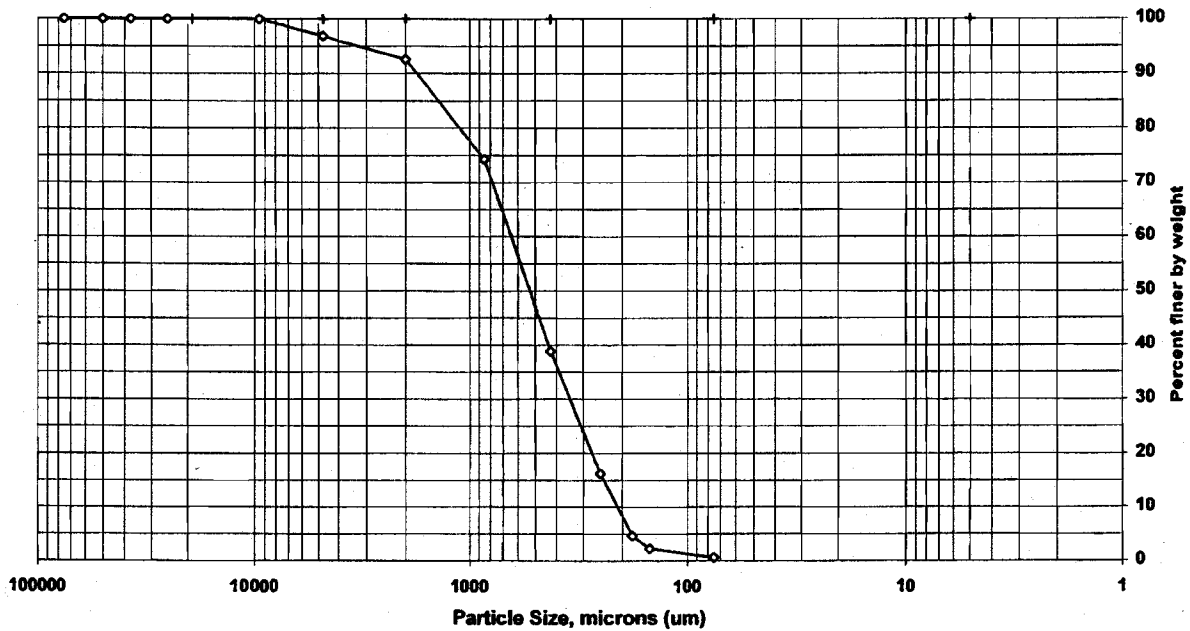
Client Code: STLCOD  
 Sample ID: CHPK00200H00105  
 Lab ID: 654689

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 84.4%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 9.5 mm

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	96.9	3.1
#10	2000	92.6	4.3
#20	850	74.2	18.4
#40	425	38.8	35.4
#60	250	16.2	22.6
#80	180	4.6	11.6
#100	150	2.2	2.4
#200	75	0.6	1.6
Hydrometer	0.0	0.0	0.6
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	3.1
Sand	96.2
Coarse Sand	4.3
Medium Sand	53.8
Fine Sand	38.2
Silt	0.6
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

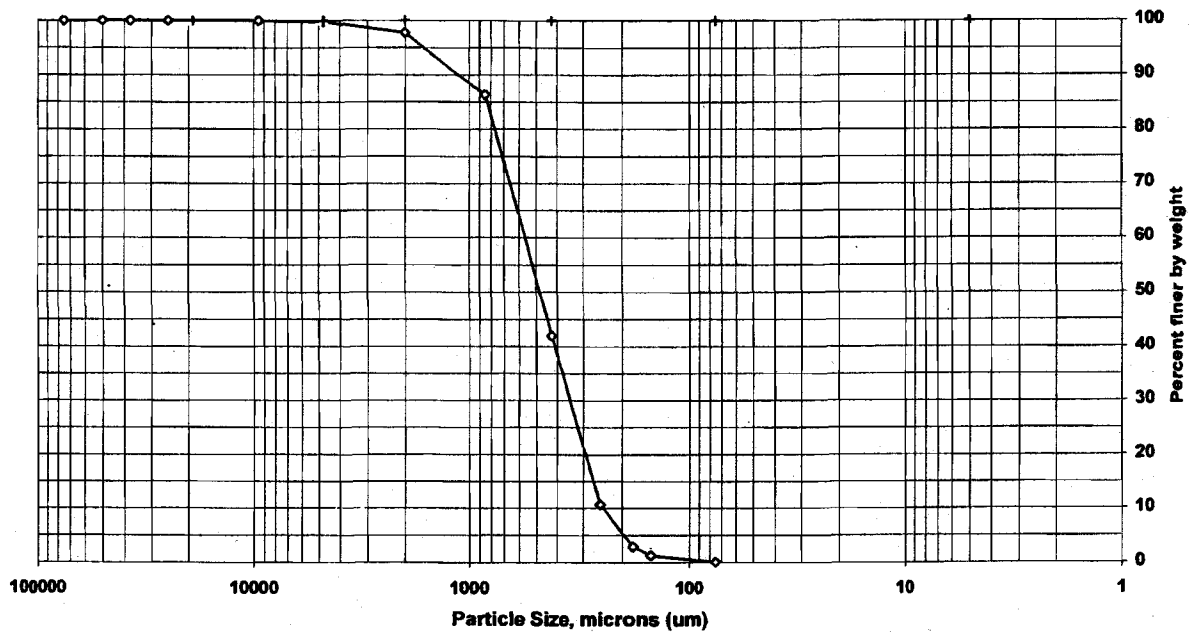
Client Code: STLCOD  
 Sample ID: CHPK00200100105  
 Lab ID: 654690

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 84.0%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 9.5 mm

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	99.8	0.2
#10	2000	97.8	2.0
#20	850	86.4	11.4
#40	425	42.0	44.4
#60	250	10.6	31.4
#80	180	2.9	7.7
#100	150	1.3	1.6
#200	75	0.1	1.2
Hydrometer	0.0	0.0	0.1
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.2
Sand	99.7
Coarse Sand	2.0
Medium Sand	55.8
Fine Sand	41.9
Silt	0.1
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

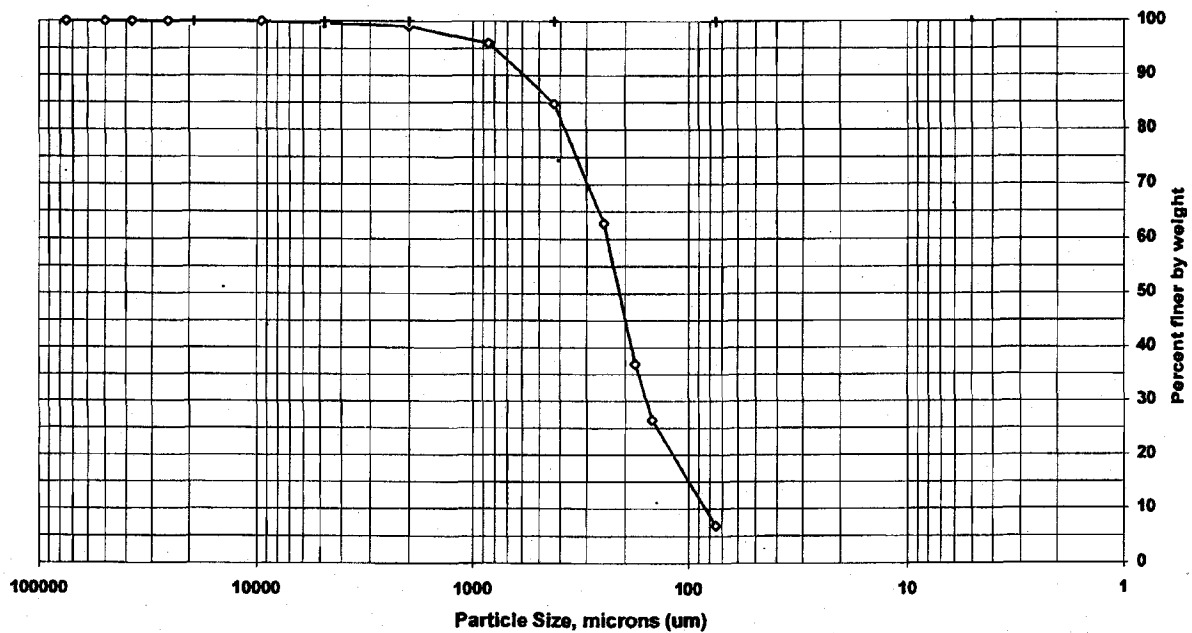
Client Code: STLCOD  
 Sample ID: CHPK00200J00105  
 Lab ID: 654691

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 84.0%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 9.5 mm

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	99.6	0.4
#10	2000	99.0	0.6
#20	850	96.0	3.1
#40	425	84.8	11.2
#60	250	62.8	22.0
#80	180	36.9	25.9
#100	150	26.5	10.4
#200	75	6.9	19.6
Hydrometer	0.0	0.0	6.9
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.4
Sand	92.7
Coarse Sand	0.6
Medium Sand	14.3
Fine Sand	77.9
Silt	6.9
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

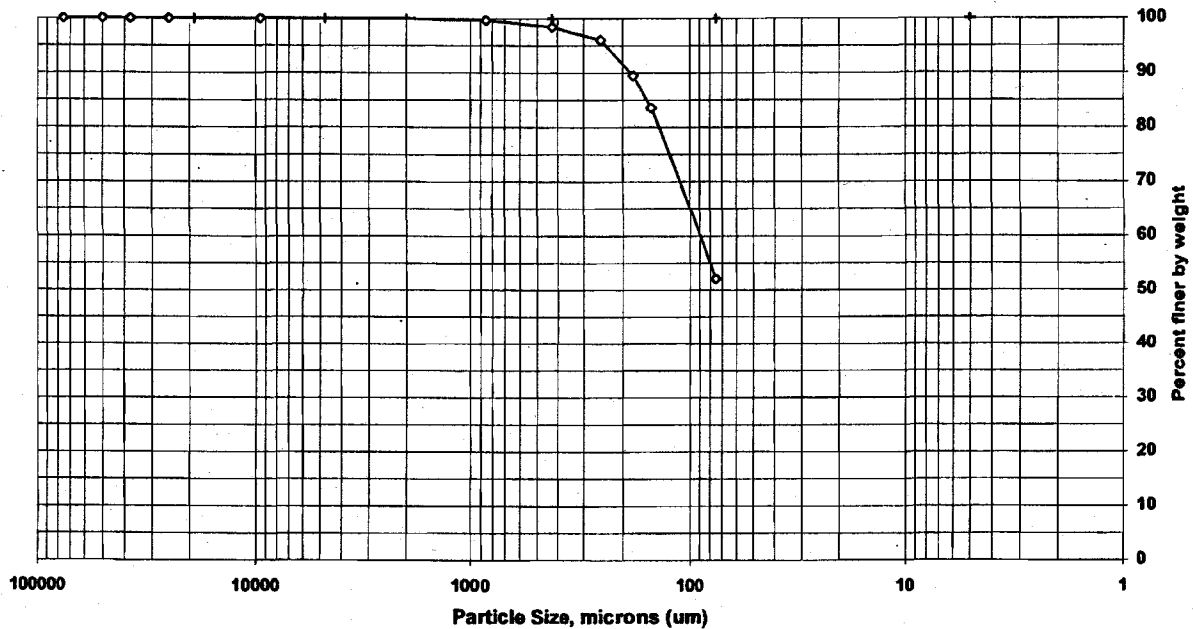
Client Code: STLCOD  
 Sample ID: CHPK00200K00105  
 Lab ID: 654692

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 80.0%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Crs sand

Non-soil material: na  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.7	0.3
#40	425	98.4	1.3
#60	250	96.0	2.4
#80	180	89.5	6.5
#100	150	83.5	5.9
#200	75	52.1	31.5
Hydrometer	0.0	0.0	52.1
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	47.9
Coarse Sand	0.0
Medium Sand	1.6
Fine Sand	46.3
Silt	52.1
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute



13.3°  
11/16/06  
1021  
noise

# Chain of Custody Record

COC Number: CH006530

CH2MHILL

1/12/2006 11:49:56 AM Page 1 of 3

Project Name MMR Location MMR  
Task Order 251 Project 2005/10 FS-28 Drilling  
Project Number 324146.05.90.07  
Project Manager R Citterman  
Sample Manager Drew Tingley (508) 968-4670  
Turnaround Time 21 Days  
PO Number RC

Sample ID Sample Date/Time Type Matrix # Containers Preserv

CHPK00200A00105

13-Oct-05 0951 N Soil

Sieve only 3'-5'

Field Filtered ☐ 1 4°C

ASTM D-422

Total Containers: 1

CHPK00200B00105

13-Oct-05 0954 N Soil

Sieve only 5'-6.1'

Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK00200C00105

13-Oct-05 0954 N Soil

Sieve only 6.1'-12.4'

Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK00200D00105

13-Oct-05 0954 N Soil

Sieve only 12.4'-13.2

Field Filtered ☐ 1 4°C

Total Containers: 1

MS = Matrix Spike SD = Matrix Spike Duplicate

	Signatures	Date/Time
Approved by	K. Citterman	1-12-06
Sampled by	M. Greenberg	10-13-05
Relinquished by	M. Greenberg	1-7-06 1600
Received by	J. W. [Signature]	1-12-06 1116/102035
Relinquished by		1-12
Received by		

Shipping Details  
Method of Shipment: FedEx  
On Ice: yes / no  
Airbill No: 7924 8689 1264  
Lab Name: Severn Trent - Denver  
Lab Phone: (303) 736-0100

ATTN:  
Sample Custody  
and  
Wayne Scott

Special Instructions:  
Report Copy to  
Vito D'Aurora  
(530) 229-3365

## Chain of Custody Record

COC Number: CH006530

CH2MHILL 1/12/2006 11:49:57 AM Page 2 of 3

Project Name MMR Location MMR  
 Task Order 251 Project 2005/10 FS-28 Drilling  
 Project Number 324146.05.90.07  
 Project Manager R Citterman  
 Sample Manager Drew Tingley (508) 968-4670  
 Turnaround Time 21 Days  
 PO Number RC

Sample ID Sample Date/Time Type Matrix # Containers Preserv

CHPK00200E00105

13-Oct-05 1004 N Soil

Sieve only 15'-18.7'

Field Filtered ☐ 1 4'C

✓

Total Containers: 1

CHPK00200F00105

13-Oct-05 1004 N Soil

Sieve only 18.7'-25.8'

Field Filtered ☐ 1 4'C

✓

Total Containers: 1

CHPK00200G00105

13-Oct-05 1017 N Soil

Sieve only 35'-39.8'

Field Filtered ☐ 1 4'C

✓

Total Containers: 1

CHPK00200H00105

13-Oct-05 1017 N Soil

Sieve only 39.8'-45.5'

Field Filtered ☐ 1 4'C

✓

Total Containers: 1

MS = Matrix Spike SD = Matrix Spike Duplicate

	Signatures	Date/Time
Approved by	K. Citterman	1-12-06
Sampled by	M. Greenberg	10-13-05
Relinquished by	M. Greenberg	1-13-06 1000
Received by	D. Tingley	12 (MB) 1/16/06 083
Relinquished by		
Received by		

## Shipping Details

Method of Shipment: FedEx

On Ice: yes / no

Airbill No:

Lab Name: Severn Trent - Denver

Lab Phone: (303) 736-0100

ATTN:

Sample Custody  
and  
Wayne Scott

Special Instructions:

Report Copy to

Vito D'Aurora  
(530) 229-3365

## Chain of Custody Record

COC Number: CH006530

CH2MHILL 1/12/2006 11:49:58 AM Page 3 of 3

Project Name MMR Location MMR  
Task Order 251 Project 2005/10 FS-28 Drilling  
Project Number 324146.05.90.07  
Project Manager R Citterman  
Sample Manager Drew Tingley (508) 968-4670  
Turnaround Time 21 Days  
PO Number RC

Sample ID Sample Date/Time Type Matrix # Containers Preserv

CHPK00200I00105

13-Oct-05 1037

N Soil

Sieve only 55'-63.8'

Field Filtered ☐ 1 4°C☒☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Total Containers: 1

CHPK00200J00105

13-Oct-05 1037

N Soil

Sieve only 63.8'-65.5'

Field Filtered ☐ 1 4°C☒☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Total Containers: 1

CHPK00200K00105

13-Oct-05 1037

N Soil

Sieve only 65.5'-70'

Field Filtered ☐ 1 4°C☒☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Total Containers: 1

ASTM D-422

MS = Matrix Spike SD = Matrix Spike Duplicate

	Signatures	Date/Time
Approved by	<i>K. Citterman</i>	1-12-06
Sampled by	<i>M. Greenberg</i>	10-13-05
Relinquished by	<i>M. Greenberg</i>	1-13-06 1600
Received by	<i>[Signature]</i>	12 11/14/06 0830
Relinquished by	<i>[Signature]</i>	
Received by		

## Shipping Details

Method of Shipment: FedEx

On Ice: yes / no

Airbill No: 7924 86891264

Lab Name: Severn Trent - Denver

Lab Phone: (303) 736-0100

ATTN:

Sample Custody

and

Wayne Scott

Special Instructions:

Report Copy to

Vito D'Aurora

(530) 229-3365

69BH2001



**STL Denver**  
4955 Yarrow Street  
Arvada, CO 80002

Tel: 303 736 0100 Fax: 303 431 7171  
[www.stl-inc.com](http://www.stl-inc.com)

## **ANALYTICAL REPORT**

2006/01 FS-28 BH Drilling

Lot #: D6A160202

Trudy Scott

CH2M Hill, Inc  
2525 Airpark Drive  
Redding, CA 96001

## **STL DENVER**



**Karen Kuoppala**  
Project Manager

February 6, 2006

## Particle Size of Soils by ASTM D422\_MOD

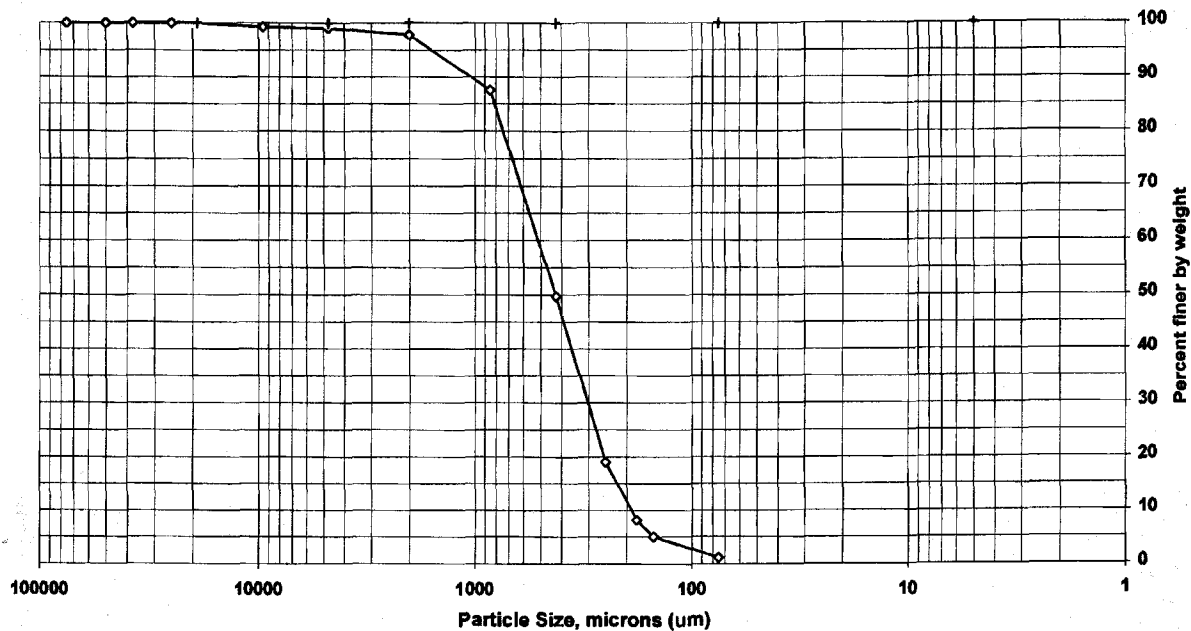
Client Code: STLCOD  
 Sample ID: CHPK00201AO0106  
 Lab ID: 654642

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 86.8%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 19 mm

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	99.3	0.7
#4	4750	99.1	0.2
#10	2000	97.8	1.2
#20	850	87.6	10.3
#40	425	49.7	37.8
#60	250	19.0	30.7
#80	180	8.2	10.9
#100	150	5.0	3.1
#200	75	1.2	3.9
Hydrometer	0.0	0.0	1.2
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.9
Sand	97.9
Coarse Sand	1.2
Medium Sand	48.1
Fine Sand	48.6
Silt	1.2
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

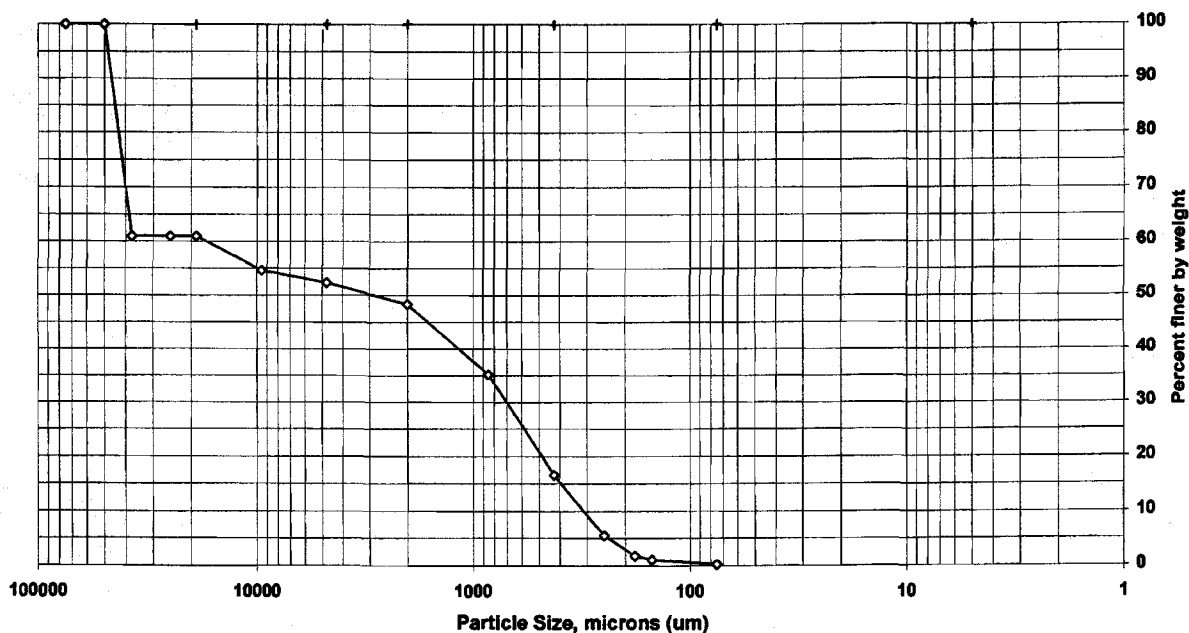
Client Code: STLCOD  
 Sample ID: CHPK00201BO0106  
 Lab ID: 654643

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 87.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 50 mm

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	60.9	39.1
1 inch	25000	60.9	0.0
3/4 inch	19000	60.9	0.0
3/8 inch	9500	54.6	6.3
#4	4750	52.4	2.2
#10	2000	48.4	4.0
#20	850	35.2	13.2
#40	425	16.6	18.6
#60	250	5.5	11.1
#80	180	1.8	3.7
#100	150	1.0	0.7
#200	75	0.2	0.8
Hydrometer	0.0	0.0	0.2
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	47.6
Sand	52.1
Coarse Sand	4.0
Medium Sand	31.8
Fine Sand	16.3
Silt	0.2
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

# Particle Size of Soils by ASTM D422\_MOD

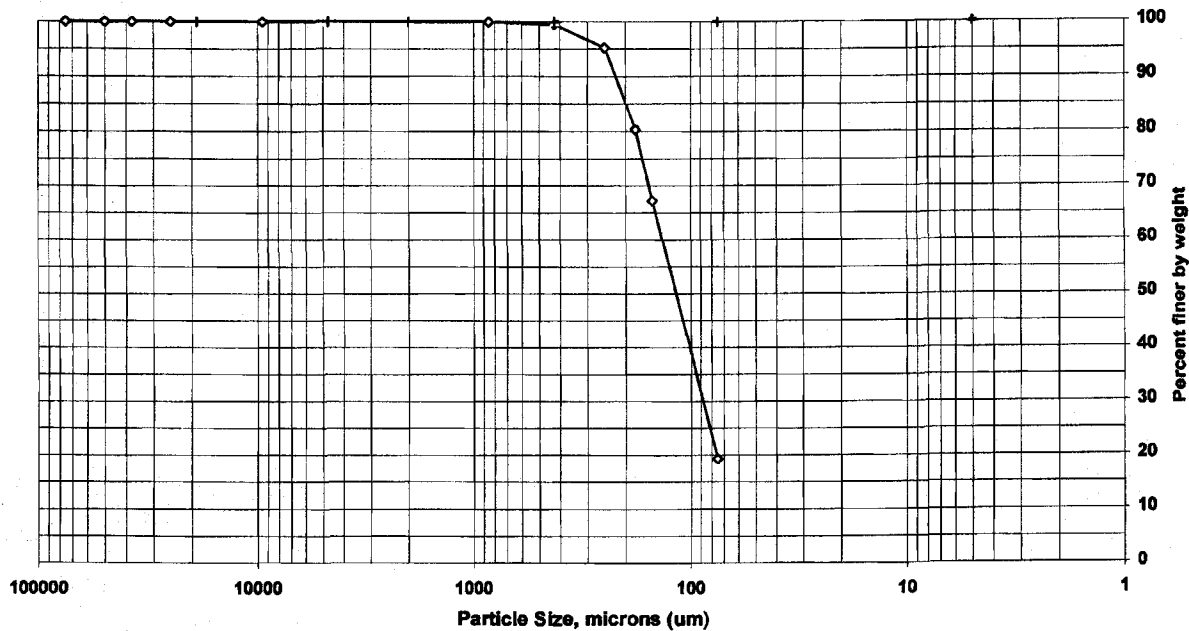
Client Code: STLCOD  
 Sample ID: CHPK00201CO0106  
 Lab ID: 654644

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 82.3%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Med sand

Non-soil material: n/a  
 Shape (> #10): n/a  
 Hardness (> #10): n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.9	0.1
#40	425	99.5	0.5
#60	250	95.2	4.3
#80	180	80.4	14.9
#100	150	67.1	13.2
#200	75	19.3	47.9
Hydrometer	0.0	0.0	19.3
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	80.7
Coarse Sand	0.0
Medium Sand	0.5
Fine Sand	80.2
Silt	19.3
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute



# Particle Size of Soils by ASTM D422\_MOD

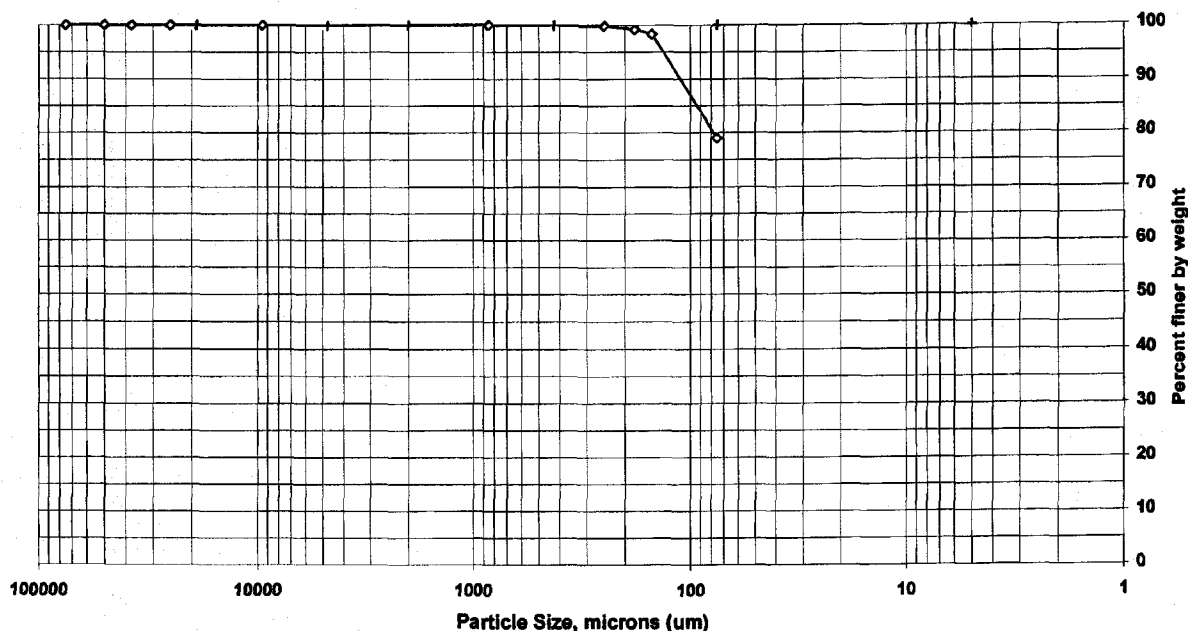
Client Code: STLCOD  
 Sample ID: CHPK00201DO0106  
 Lab ID: 654645

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 75.0%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Med sand

Non-soil material: n/a  
 Shape (> #10): n/a  
 Hardness (> #10): n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	100.0	0.0
#40	425	100.0	0.0
#60	250	99.8	0.2
#80	180	99.2	0.7
#100	150	98.3	0.9
#200	75	79.0	19.3
Hydrometer	0.0	0.0	79.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	21.0
Coarse Sand	0.0
Medium Sand	0.0
Fine Sand	21.0
Silt	79.0
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

# Particle Size of Soils by ASTM D422\_MOD

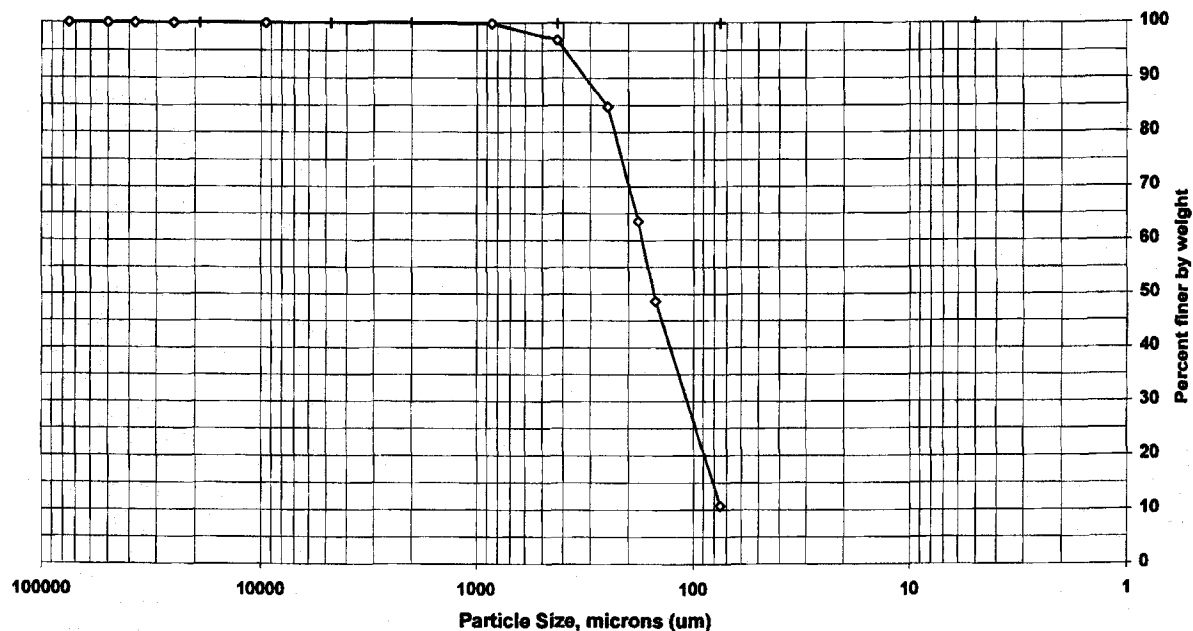
Client Code: STLCOD  
 Sample ID: CHPK00201EO0106  
 Lab ID: 654646

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 82.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Med sand

Non-soil material: n/a  
 Shape (> #10): n/a  
 Hardness (> #10): n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.9	0.1
#40	425	96.9	3.0
#60	250	84.7	12.2
#80	180	63.5	21.2
#100	150	48.6	14.9
#200	75	10.7	37.9
Hydrometer	0.0	0.0	10.7
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	89.3
Coarse Sand	0.0
Medium Sand	3.1
Fine Sand	86.2
Silt	10.7
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

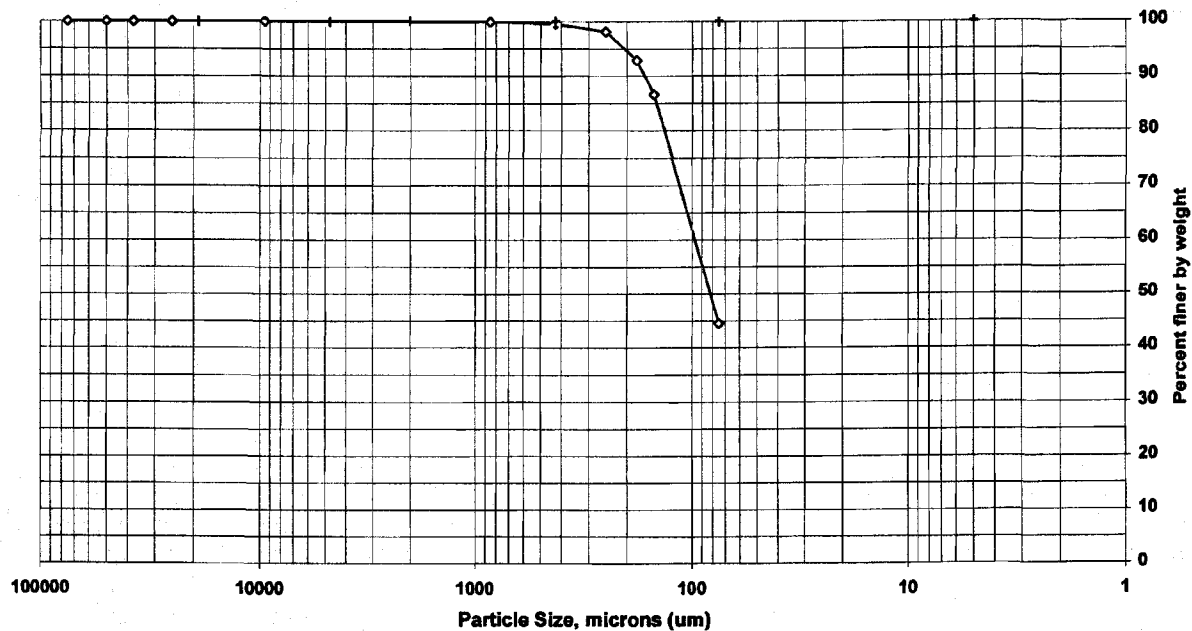
Client Code: STLCOD  
 Sample ID: CHPK00201FO0106  
 Lab ID: 654647

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 82.7%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Crs sand

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.9	0.1
#40	425	99.5	0.4
#60	250	98.2	1.4
#80	180	92.9	5.3
#100	150	86.7	6.2
#200	75	44.5	42.2
Hydrometer	0.0	0.0	44.5
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	55.5
Coarse Sand	0.0
Medium Sand	0.4
Fine Sand	55.1
Silt	44.5
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

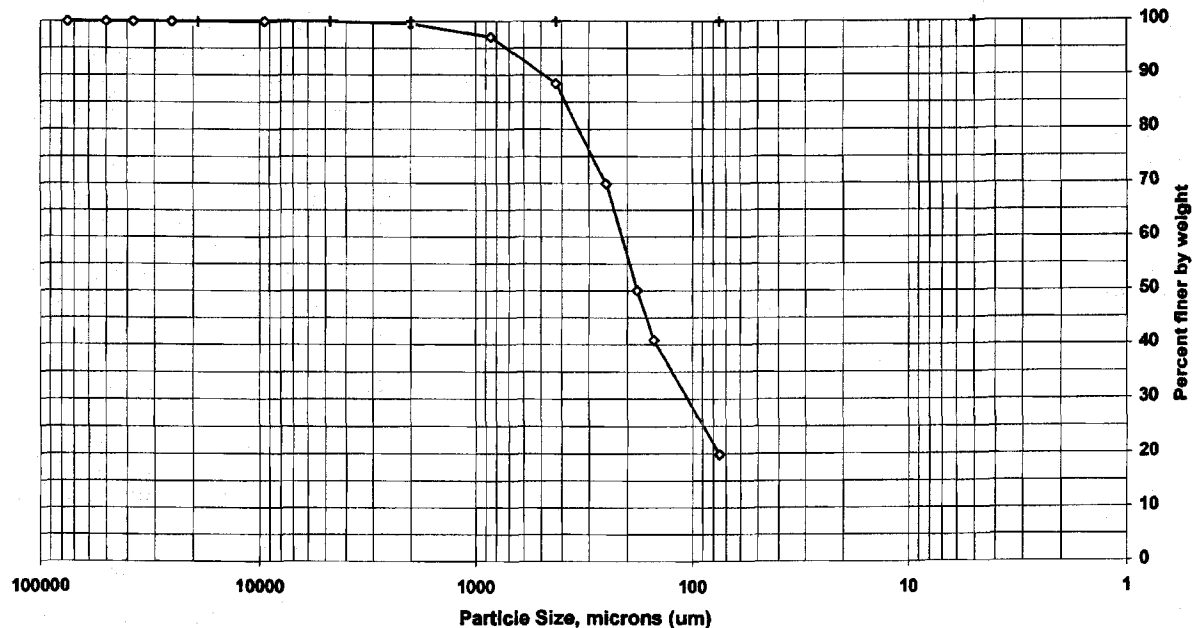
Client Code: STLCOD  
 Sample ID: CHPK00201GO0106  
 Lab ID: 654648

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 85.5%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Crs sand

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	99.5	0.5
#20	850	97.1	2.4
#40	425	88.4	8.7
#60	250	69.9	18.5
#80	180	50.1	19.8
#100	150	40.8	9.3
#200	75	19.8	21.0
Hydrometer	0.0	0.0	19.8
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	80.2
Coarse Sand	0.5
Medium Sand	11.2
Fine Sand	68.6
Silt	19.8
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

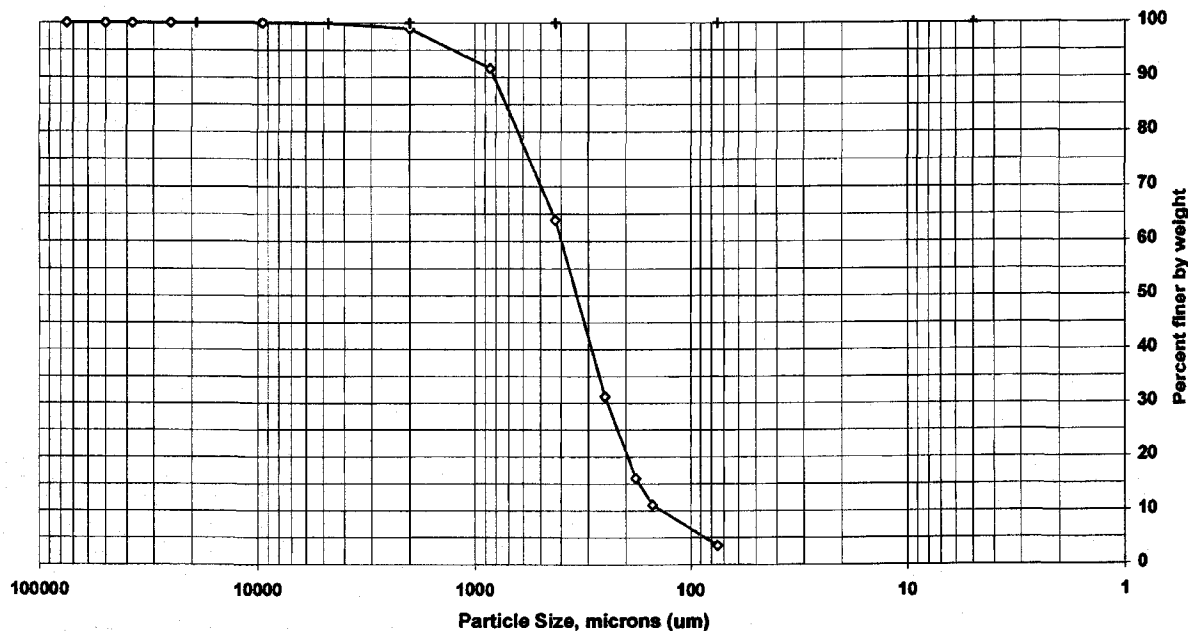
Client Code: STLCOD  
 Sample ID: CHPK00201HO0106  
 Lab ID: 654649

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 86.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 9.5 mm

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	99.9	0.1
#10	2000	99.0	1.0
#20	850	91.6	7.3
#40	425	63.9	27.7
#60	250	31.2	32.6
#80	180	16.0	15.2
#100	150	11.1	4.9
#200	75	3.5	7.6
Hydrometer	0.0	0.0	3.5
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.1
Sand	96.4
Coarse Sand	1.0
Medium Sand	35.1
Fine Sand	60.4
Silt	3.5
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

# Particle Size of Soils by ASTM D422\_MOD

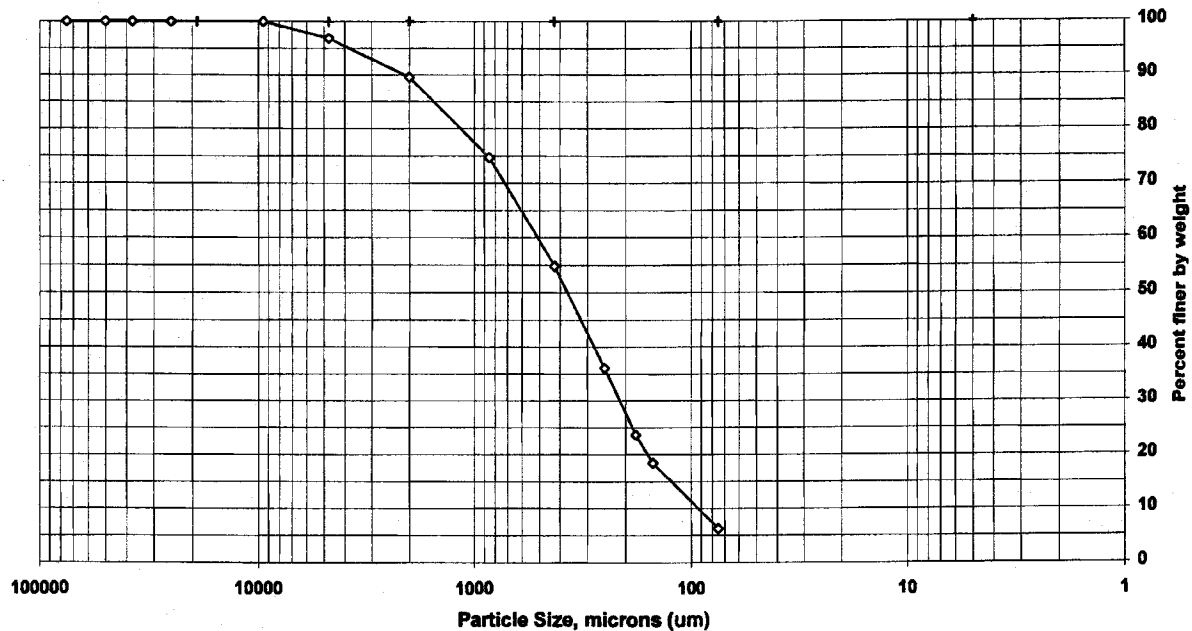
Client Code: STLCOD  
 Sample ID: CHPK00201IO0106  
 Lab ID: 654650

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 86.8%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 9.5 mm

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	96.8	3.2
#10	2000	89.5	7.3
#20	850	74.7	14.9
#40	425	54.8	19.8
#60	250	36.1	18.7
#80	180	23.6	12.5
#100	150	18.4	5.3
#200	75	6.2	12.1
Hydrometer	0.0	0.0	6.2
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	3.2
Sand	90.6
Coarse Sand	7.3
Medium Sand	34.7
Fine Sand	48.6
Silt	6.2
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

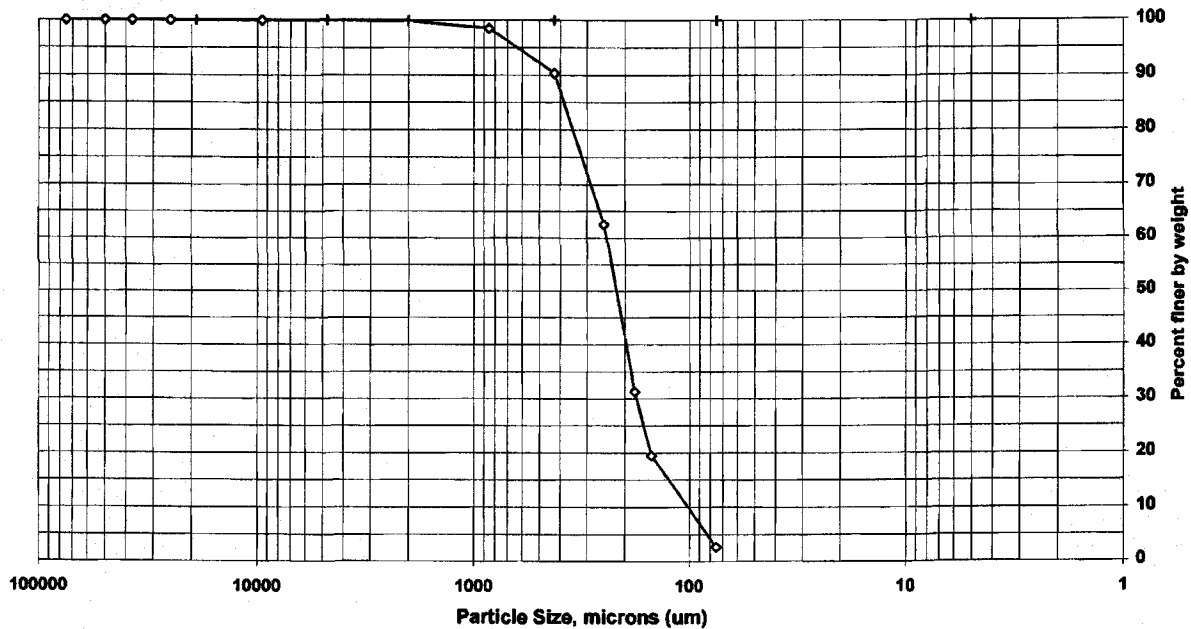
Client Code: STLCOD  
 Sample ID: CHPK00201JO0106  
 Lab ID: 654651

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 82.5%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Crs sand

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	99.9	0.1
#20	850	98.5	1.3
#40	425	90.3	8.2
#60	250	62.5	27.9
#80	180	31.3	31.2
#100	150	19.5	11.8
#200	75	2.6	16.8
Hydrometer	0.0	0.0	2.6
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	97.4
Coarse Sand	0.1
Medium Sand	9.5
Fine Sand	87.7
Silt	2.6
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute



## Particle Size of Soils by ASTM D422\_MOD

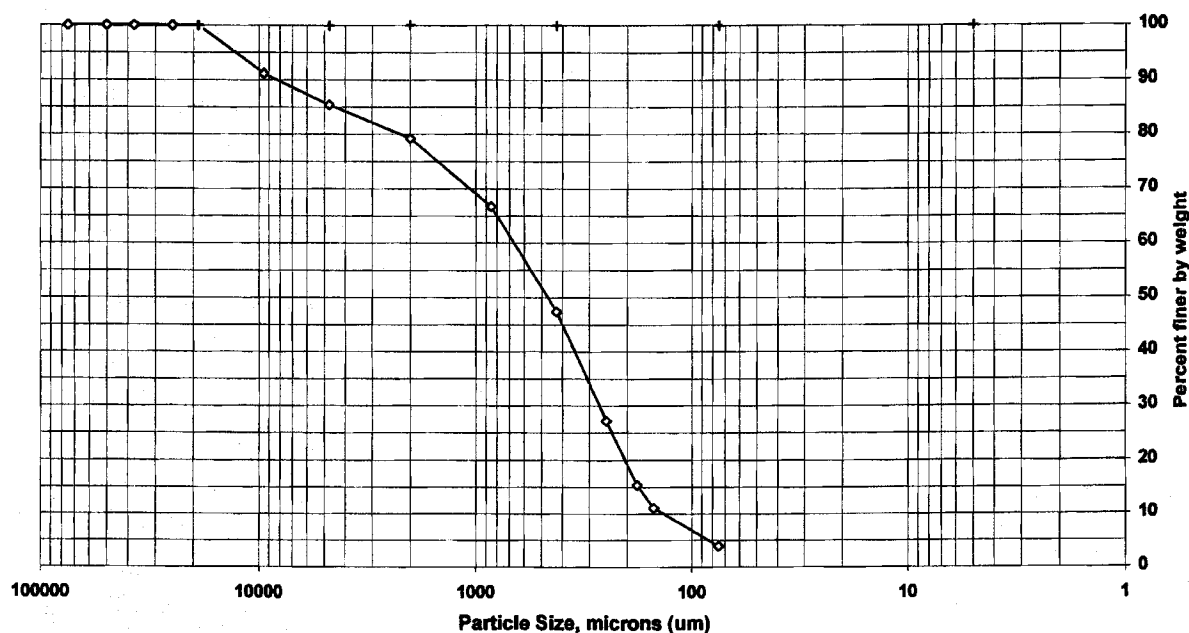
Client Code: STLCOD  
 Sample ID: CHPK00201KO0106  
 Lab ID: 654652

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 87.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 19 mm

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	91.2	8.8
#4	4750	85.5	5.7
#10	2000	79.2	6.3
#20	850	66.7	12.5
#40	425	47.4	19.3
#60	250	27.2	20.2
#80	180	15.4	11.9
#100	150	11.1	4.2
#200	75	3.9	7.2
Hydrometer	0.0	0.0	3.9
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	14.5
Sand	81.5
Coarse Sand	6.3
Medium Sand	31.8
Fine Sand	43.5
Silt	3.9
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

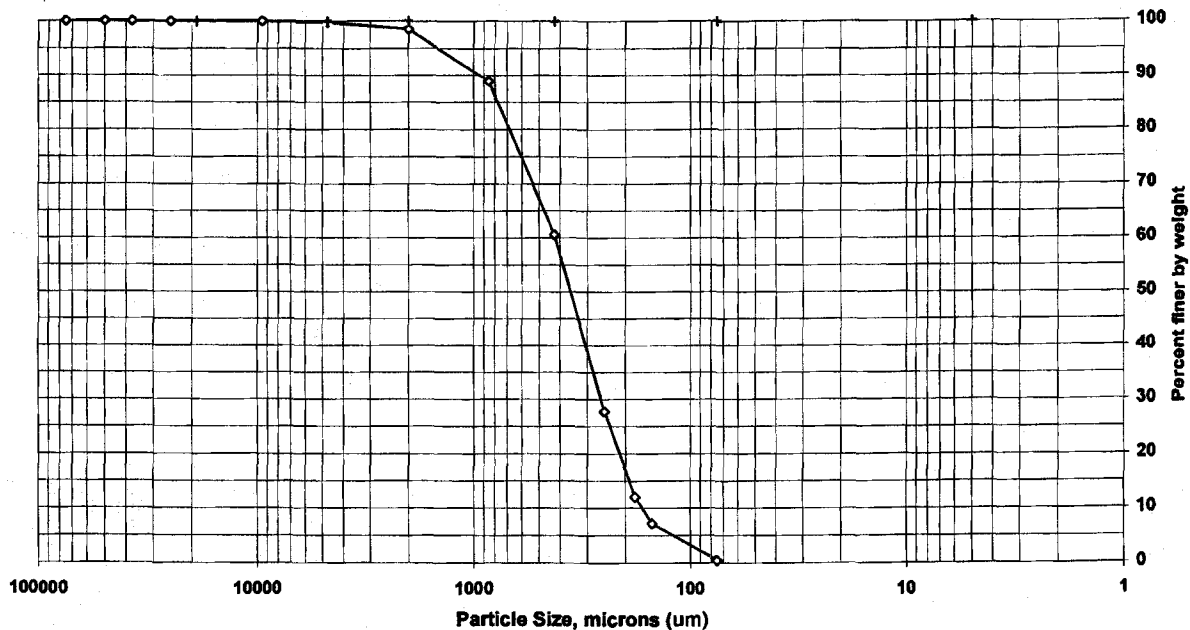
Client Code:	STLCOD
Sample ID:	CHPK00201LO0106
Lab ID:	654653

**SDG:** 6A120202  
**ETR(s):** 112129

**Date Received:** 1/17/2006  
**Start Date:** 1/19/2006  
**End Date:** 2/2/2006

<b>Percent Solids:</b>	<u>83.6%</u>	
<b>Specific Gravity:</b>	<u>2.650</u>	(assumed)
<b>Maximum Particle Size:</b>	<u>9.5 mm</u>	

<b>Non-soil material:</b>	n/a
<b>Shape (&gt; #10):</b>	subrounded
<b>Hardness (&gt; #10):</b>	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	99.8	0.2
#10	2000	98.6	1.2
#20	850	89.0	9.6
#40	425	60.6	28.4
#60	250	27.8	32.8
#80	180	12.0	15.7
#100	150	7.2	4.8
#200	75	0.5	6.7
Hydrometer	0.0	0.0	0.5
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.2
Sand	99.3
Coarse Sand	1.2
Medium Sand	38.0
Fine Sand	60.1
Silt	0.5
Clay	0.0

Preparation Method: **D2217**  
Dispersion Device: Mechanical mixer with  
a metal paddle.  
Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

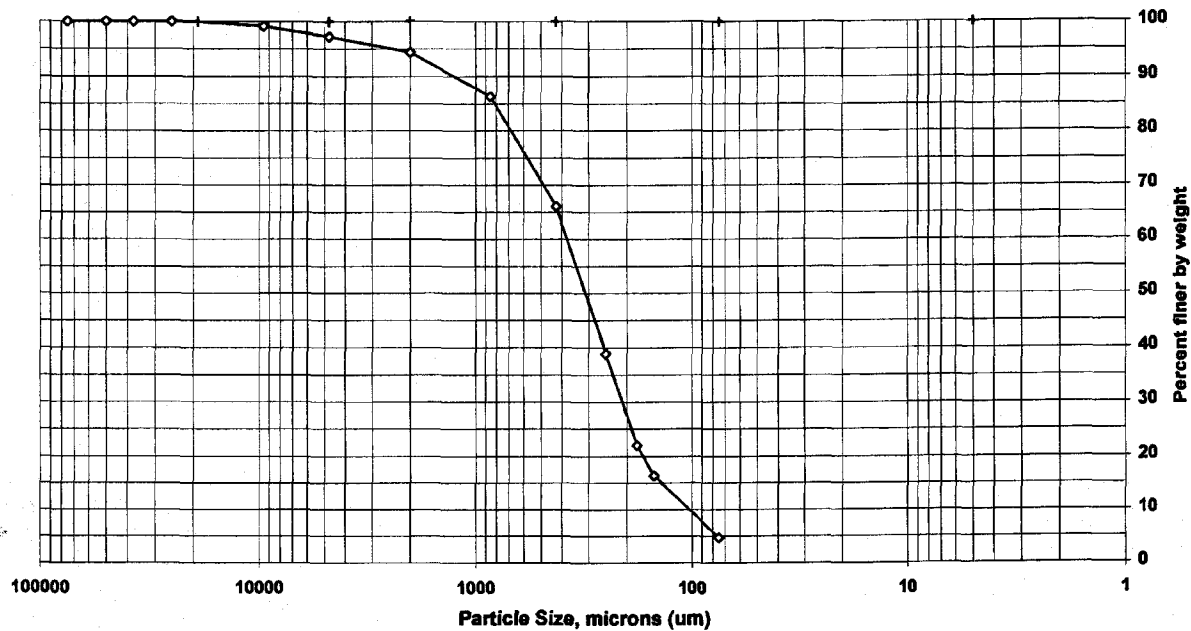
Client Code: STLCOD  
 Sample ID: CHPK00201MO0106  
 Lab ID: 654654

SDG: 6A120202  
 ETR(s): 112129

Date Received: 1/17/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 84.1%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 19 mm

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	99.2	0.8
#4	4750	97.2	1.9
#10	2000	94.4	2.8
#20	850	86.4	8.0
#40	425	66.1	20.3
#60	250	38.9	27.1
#80	180	22.1	16.8
#100	150	16.4	5.7
#200	75	4.7	11.7
Hydrometer	0.0	0.0	4.7
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	2.8
Sand	92.5
Coarse Sand	2.8
Medium Sand	28.3
Fine Sand	61.4
Silt	4.7
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Chain of Custody Record

COC Number: CH006462

CH2MHILL

Page 1 of 5

Project Name MMR Location MMR  
 Task Order 251 Project 2006/01 FS-28 BH Drilling  
 Project Number 324146.05.90.07  
 Project Manager R Citterman  
 Sample Manager Drew Tingley (508) 968-4670  
 Turnaround Time ~~4 Days~~ 21 Days  
 PO Number RC KC 12406

ASTM D-422

Sample ID Sample Date/Time Type Matrix # Containers Preserv

CHPK00201AO0106 01/05/06 1434 N Soil

Sieve only 19.7-24.3'

Field Filtered ☐ 1 4'C

Total Containers: 1

CHPK00201BO0106 01/05/06 1557 N Soil

Sieve only 35.0-40.0'

Field Filtered ☐ 1 4'C

Total Containers: 1

CHPK00201CO0106 01/06/06 0923 N Soil

Sieve only 69.1-74.1'

Field Filtered ☐ 1 4'C

Total Containers: 1

CHPK00201DO0106 01/06/06 1411 N Soil

Sieve only 75-81.8'

Field Filtered ☐ 1 4'C

Total Containers: 1

MS = Matrix Spike SD = Matrix Spike Duplicate

	Signatures	Date/Time
Approved by	<i>R. Citterman</i>	1-4-06
Sampled by	<i>M. Green</i>	1-12-06
Relinquished by	<i>M. Green</i>	1-12-06/1600
Received by	<i>John W. Scott</i>	11/6/06 0830
Relinquished by		
Received by		

## Shipping Details

Method of Shipment: FedEx

On Ice: yes / no

Airbill No: 790284386536

Lab Name: Severn Trent - Denver

Lab Phone: (303) 736-0100

ATTN:

Sample Custody

and

Wayne Scott

Special Instructions:

Report Copy to

Vito D'Aurora

(530) 229-3365

STL Denver

## Chain of Custody Record

COC Number: CH006462

CH2MHILL

Page 2 of 5

Project Name MMR Location MMR  
 Task Order 251 Project 2006/01 FS-28 BH Drilling  
 Project Number 324146.05.90.07  
 Project Manager R Citterman  
 Sample Manager Drew Tingley (508) 968-4670  
 Turnaround Time ~~1 Day~~ 21 Days  
 PO Number RC KC 1-4306

ASTM D-422

Sample ID Sample Date/Time Type Matrix # Containers Preserv

CHPK00201EO0106 01/06/06 1141 N Soil

Sieve only 91.8-91.2' Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK00201FO0106 01/06/06 1403 N Soil

Sieve only 95-98.9' Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK00201GO0106 01/06/06 1403 N Soil

Sieve only 104.4-111.6' Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK00201HO0106 01/09/06 0800 N Soil

Sieve only 115-133.2' Field Filtered ☐ 1 4°C

Total Containers: 1

MS = Matrix Spike SD = Matrix Spike Duplicate

	Signatures	Date/Time
Approved by	K. Citterman	1-4-06
Sampled by	M. Dwyer	1-12-06
Relinquished by	M. Dwyer	1-12-06/1600
Received by	J. Wey	1/12/06 0830
Relinquished by		
Received by		

## Shipping Details

Method of Shipment: FedEx

On Ice: yes / ☒

Airbill No: 790284386536

Lab Name: Severn Trent - Denver

Lab Phone: (303) 736-0100

ATTN:

Sample Custody  
and  
Wayne Scott

Special Instructions:

Report Copy to

Vito D'Aurora

(530) 229-3365

## Chain of Custody Record

COC Number: CH006462

CH2MHILL

Page 3 of 5

Project Name MMR Location MMR  
 Task Order 251 Project 2006/01 FS-28 BH Drilling  
 Project Number 324146.05.90.07  
 Project Manager R Citterman  
 Sample Manager Drew Tingley (508) 968-4670  
 Turnaround Time ~~4 Days~~ 21 Days  
 PO Number RC KC 1-4-06

ASTM D-422

Sample ID Sample Date/Time Type Matrix # Containers Preserv

CHPK00201IO0106 01-09-06 / 1237 N Soil

Sieve only 135-154'

Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK00201JO0106 01-09-06 / 1527 N Soil

Sieve only 168.2-172.8'

Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK00201KO0106 01/09/06 1033 N Soil

Sieve only 175-182.2'

Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK00201LO0106 01/10/06 1033 N Soil

Sieve only 182.2-195'

Field Filtered ☐ 1 4°C

Total Containers: 1

MS = Matrix Spike SD = Matrix Spike Duplicate

	Signatures	Date/Time
Approved by	K. Citterman	1-4-06
Sampled by	M. Greeny	1-12-06
Relinquished by	M. Greeny	1-12-06 / 1600
Received by	J. W. [Signature]	1/16/06 0830
Relinquished by		
Received by		

## Shipping Details

Method of Shipment: FedEx

On Ice: yes / ☒ no

Airbill No: 790284386536

Lab Name: Severn Trent - Denver

Lab Phone: (303) 736-0100

ATTN:

Sample Custody

and

Wayne Scott

Special Instructions:

Report Copy to

Vito D'Aurora

(530) 229-3365

STL Denver

## Chain of Custody Record

COC Number: CH006462

CH2MHILL

Page 4 of 5

Project Name MMR Location MMR  
Task Order 251 Project 2006/01 FS-28 BH Drilling  
Project Number 324146.05.90.07  
Project Manager R Citterman  
Sample Manager Drew Tingley (508) 968-4670  
Turnaround Time ~~4 Days~~ 21 Days  
PO Number RC K21-4-06

ASTM D-422

Sample ID Sample Date/Time Type Matrix # Containers Preserv

CHPK00201MO0106 01/14/06 1340 N Soil

Sieve only 195-23.2 Field Filtered ☐ 1 4°C

Total Containers: 1

~~CHPK00201NO0106 N Soil~~~~Sieve only Field Filtered ☐ 1 4°C~~~~Total Containers: 1~~~~CHPK00201OO0106 N Soil~~~~Sieve only Field Filtered ☐ 1 4°C~~~~Total Containers: 1~~~~CHPK00201PO0106 N Soil~~~~Sieve only Field Filtered ☐ 1 4°C~~~~Total Containers: 1~~

MS = Matrix Spike SD = Matrix Spike Duplicate

	Signatures	Date/Time
Approved by	<i>R. Citterman</i>	1-4-06
Sampled by	<i>M. Green</i>	1-12-06
Relinquished by	<i>M. Green</i>	1-12-06 / 1600
Received by	<i>John</i>	1/16/06 0830
Relinquished by		
Received by		

## Shipping Details

Method of Shipment: FedEx

On Ice: yes / no

Airbill No: 790284386536

Lab Name: Severn Trent - Denver

Lab Phone: (303) 736-0100

ATTN:

Sample Custody

and

Wayne Scott

Special Instructions:

Report Copy to

Vito D'Aurora

(530) 229-3365

STL Denver

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	12.3-17.0, 19.0-22.0, 23.3-25.0	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	114.70	100.00	0.00
3/4-inch	0.7500	0.00	114.70	100.00	0.00
4	0.1870	6.10	108.60	94.68	5.32
6	0.1320	2.60	106.00	92.41	7.59
8	0.0940				
10	0.0787	6.00	100.00	87.18	12.82
12	0.0661	2.50	97.50	85.00	15.00
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	25.00	72.50	63.21	36.79
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	40.40	32.10	27.99	72.01
50	0.0117	14.40	17.70	15.43	84.57
70	0.0080				
80	0.0070	9.80	7.90	6.89	93.11
200	0.0029	4.70	3.20	2.79	97.21
Pan	0	3.20	0.00	0.00	100.00
Total:		114.70			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	5.32	
% Coarse Sand	7.50	
% Med. Sand	59.20	
% Fine Sand	25.20	
%Gravel	5.32	
%Sand	91.89	
%Silt & Clay	2.79	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	114.70	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	114.70	100.00	0.00	Little	11-21%
4	0.1870	6.10	108.60	94.68	5.32	Some	21-36%
6	0.1320	2.60	106.00	92.41	7.59	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	6.00	100.00	87.18	12.82		
12	0.0661	2.50	97.50	85.00	15.00	"and" (ie: gravel and sand)	45-50%
20	0.0331	25.00	72.50	63.21	36.79		
40	0.0165	40.40	32.10	27.99	72.01		
50	0.0117	14.40	17.70	15.43	84.57		
80	0.0070	9.80	7.90	6.89	93.11		
200	0.0029	4.70	3.20	2.79	97.21		
Pan	0.0000	3.20	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE



**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	17.0-19.0	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	112.60	100.00	0.00
3/4-inch	0.7500	0.00	112.60	100.00	0.00
4	0.1870	0.10	112.50	99.91	0.09
6	0.1320	0.20	112.30	99.73	0.27
8	0.0940				
10	0.0787	0.60	111.70	99.20	0.80
12	0.0661	0.60	111.10	98.67	1.33
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	8.80	102.30	90.85	9.15
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	45.00	57.30	50.89	49.11
50	0.0117	26.10	31.20	27.71	72.29
70	0.0080				
80	0.0070	24.30	6.90	6.13	93.87
200	0.0029	6.60	0.30	0.27	99.73
Pan	0	0.30	0.00	0.00	100.00
Total:		112.60			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.09	
% Coarse Sand	0.71	
% Med. Sand	48.31	
% Fine Sand	50.62	
%Gravel	0.09	
%Sand	99.64	
%Silt & Clay	0.27	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	112.60	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	112.60	100.00	0.00	Little	11-21%
4	0.1870	0.10	112.50	99.91	0.09	Some	21-36%
6	0.1320	0.20	112.30	99.73	0.27	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.60	111.70	99.20	0.80		
12	0.0661	0.60	111.10	98.67	1.33	"and" (ie: gravel and sand)	45-50%
20	0.0331	8.80	102.30	90.85	9.15		
40	0.0165	45.00	57.30	50.89	49.11		
50	0.0117	26.10	31.20	27.71	72.29		
80	0.0070	24.30	6.90	6.13	93.87		
200	0.0029	6.60	0.30	0.27	99.73		
Pan	0.0000	0.30	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	22.0-23.3	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	117.20	100.00	0.00
3/4-inch	0.7500	0.00	117.20	100.00	0.00
4	0.1870	14.60	102.60	87.54	12.46
6	0.1320	4.00	98.60	84.13	15.87
8	0.0940				
10	0.0787	7.50	91.10	77.73	22.27
12	0.0661	3.20	87.90	75.00	25.00
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	27.50	60.40	51.54	48.46
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	38.70	21.70	18.52	81.48
50	0.0117	13.40	8.30	7.08	92.92
70	0.0080				
80	0.0070	7.20	1.10	0.94	99.06
200	0.0029	1.00	0.10	0.09	99.91
Pan	0	0.10	0.00	0.00	100.00
Total:		117.20			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	12.46	
% Coarse Sand	9.81	
% Med. Sand	59.22	
% Fine Sand	18.43	
%Gravel	12.46	
%Sand	87.46	
%Silt & Clay	0.09	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	117.20	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	117.20	100.00	0.00	Little	11-21%
4	0.1870	14.60	102.60	87.54	12.46	Some	21-36%
6	0.1320	4.00	98.60	84.13	15.87	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	7.50	91.10	77.73	22.27		
12	0.0661	3.20	87.90	75.00	25.00	"and" (ie: gravel and sand)	45-50%
20	0.0331	27.50	60.40	51.54	48.46		
40	0.0165	38.70	21.70	18.52	81.48		
50	0.0117	13.40	8.30	7.08	92.92		
80	0.0070	7.20	1.10	0.94	99.06		
200	0.0029	1.00	0.10	0.09	99.91		
Pan	0.0000	0.10	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	25.0-25.8	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	25.00	93.70	78.94	21.06
3/4-inch	0.7500	0.00	93.70	78.94	21.06
4	0.1870	24.00	69.70	58.72	41.28
6	0.1320	2.60	67.10	56.53	43.47
8	0.0940				
10	0.0787	5.20	61.90	52.15	47.85
12	0.0661	2.40	59.50	50.13	49.87
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	18.60	40.90	34.46	65.54
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	28.70	12.20	10.28	89.72
50	0.0117	6.50	5.70	4.80	95.20
70	0.0080				
80	0.0070	4.40	1.30	1.10	98.90
200	0.0029	0.90	0.40	0.34	99.66
Pan	0	0.40	0.00	0.00	100.00
Total:		118.70			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	20.22	
% Coarse Sand	6.57	
% Med. Sand	41.87	
% Fine Sand	9.94	
%Gravel	20.22	
%Sand	58.38	
%Silt & Clay	0.34	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	25.00	93.70	78.94	21.06	Trace	<11%
3/4-inch	0.7500	0.00	93.70	78.94	21.06	Little	11-21%
4	0.1870	24.00	69.70	58.72	41.28	Some	21-36%
6	0.1320	2.60	67.10	56.53	43.47	Adjective ending in "y" (ie: silty, sandy, gravelly) "and" (ie: gravel and sand)	36-45%
10	0.0787	5.20	61.90	52.15	47.85		
12	0.0661	2.40	59.50	50.13	49.87		
20	0.0331	18.60	40.90	34.46	65.54	(ie: gravel and sand)	45-50%
40	0.0165	28.70	12.20	10.28	89.72		
50	0.0117	6.50	5.70	4.80	95.20		
80	0.0070	4.40	1.30	1.10	98.90		
200	0.0029	0.90	0.40	0.34	99.66		
Pan	0.0000	0.40	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	35.0-39.4	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	109.60	100.00	0.00
3/4-inch	0.7500	0.00	109.60	100.00	0.00
4	0.1870	13.40	96.20	87.77	12.23
6	0.1320	1.20	95.00	86.68	13.32
8	0.0940				
10	0.0787	3.00	92.00	83.94	16.06
12	0.0661	1.50	90.50	82.57	17.43
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	16.90	73.60	67.15	32.85
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	38.40	35.20	32.12	67.88
50	0.0117	20.10	15.10	13.78	86.22
70	0.0080				
80	0.0070	12.40	2.70	2.46	97.54
200	0.0029	2.30	0.40	0.36	99.64
Pan	0	0.40	0.00	0.00	100.00
Total:		109.60			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	12.23	
% Coarse Sand	3.83	
% Med. Sand	51.82	
% Fine Sand	31.75	
%Gravel	12.23	
%Sand	87.41	
%Silt & Clay	0.36	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	109.60	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	109.60	100.00	0.00	Little	11-21%
4	0.1870	13.40	96.20	87.77	12.23	Some	21-36%
6	0.1320	1.20	95.00	86.68	13.32	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	3.00	92.00	83.94	16.06		
12	0.0661	1.50	90.50	82.57	17.43	"and" (ie: gravel and sand)	45-50%
20	0.0331	16.90	73.60	67.15	32.85		
40	0.0165	38.40	35.20	32.12	67.88		
50	0.0117	20.10	15.10	13.78	86.22		
80	0.0070	12.40	2.70	2.46	97.54		
200	0.0029	2.30	0.40	0.36	99.64		
Pan	0.0000	0.40	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	39.4-40.6	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	109.90	100.00	0.00
3/4-inch	0.7500	0.00	109.90	100.00	0.00
4	0.1870	0.00	109.90	100.00	0.00
6	0.1320	0.10	109.80	99.91	0.09
8	0.0940				
10	0.0787	0.10	109.70	99.82	0.18
12	0.0661	0.10	109.60	99.73	0.27
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	2.60	107.00	97.36	2.64
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	20.30	86.70	78.89	21.11
50	0.0117	22.80	63.90	58.14	41.86
70	0.0080				
80	0.0070	47.50	16.40	14.92	85.08
200	0.0029	15.60	0.80	0.73	99.27
Pan	0	0.80	0.00	0.00	100.00
Total:		109.90			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.18	
% Med. Sand	20.93	
% Fine Sand	78.16	
%Gravel	0.00	
%Sand	99.27	
%Silt & Clay	0.73	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	109.90	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	109.90	100.00	0.00	Little	11-21%
4	0.1870	0.00	109.90	100.00	0.00	Some	21-36%
6	0.1320	0.10	109.80	99.91	0.09	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.10	109.70	99.82	0.18		
12	0.0661	0.10	109.60	99.73	0.27		
20	0.0331	2.60	107.00	97.36	2.64	"and" (ie: gravel and sand)	45-50%
40	0.0165	20.30	86.70	78.89	21.11		
50	0.0117	22.80	63.90	58.14	41.86		
80	0.0070	47.50	16.40	14.92	85.08		
200	0.0029	15.60	0.80	0.73	99.27		
Pan	0.0000	0.80	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	40.6-42.7	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	112.50	100.00	0.00
3/4-inch	0.7500	0.00	112.50	100.00	0.00
4	0.1870	0.00	112.50	100.00	0.00
6	0.1320	0.30	112.20	99.73	0.27
8	0.0940				
10	0.0787	0.80	111.40	99.02	0.98
12	0.0661	0.90	110.50	98.22	1.78
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	9.30	101.20	89.96	10.04
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	48.50	52.70	46.84	53.16
50	0.0117	30.10	22.60	20.09	79.91
70	0.0080				
80	0.0070	17.50	5.10	4.53	95.47
200	0.0029	4.80	0.30	0.27	99.73
Pan	0	0.30	0.00	0.00	100.00
Total:		112.50			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.98	
% Med. Sand	52.18	
% Fine Sand	46.58	
%Gravel	0.00	
%Sand	99.73	
%Silt & Clay	0.27	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	112.50	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	112.50	100.00	0.00	Little	11-21%
4	0.1870	0.00	112.50	100.00	0.00	Some	21-36%
6	0.1320	0.30	112.20	99.73	0.27	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.80	111.40	99.02	0.98		
12	0.0661	0.90	110.50	98.22	1.78	"and" (ie: gravel and sand)	45-50%
20	0.0331	9.30	101.20	89.96	10.04		
40	0.0165	48.50	52.70	46.84	53.16		
50	0.0117	30.10	22.60	20.09	79.91		
80	0.0070	17.50	5.10	4.53	95.47		
200	0.0029	4.80	0.30	0.27	99.73		
Pan	0.0000	0.30	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	55.0-59.7	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	111.80	100.00	0.00
3/4-inch	0.7500	0.00	111.80	100.00	0.00
4	0.1870	0.20	111.60	99.82	0.18
6	0.1320	0.20	111.40	99.64	0.36
8	0.0940				
10	0.0787	0.50	110.90	99.19	0.81
12	0.0661	0.50	110.40	98.75	1.25
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	12.70	97.70	87.39	12.61
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	33.60	64.10	57.33	42.67
50	0.0117	21.20	42.90	38.37	61.63
70	0.0080				
80	0.0070	27.30	15.60	13.95	86.05
200	0.0029	14.80	0.80	0.72	99.28
Pan	0	0.80	0.00	0.00	100.00
Total:		111.80			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.18	
% Coarse Sand	0.63	
% Med. Sand	41.86	
% Fine Sand	56.62	
%Gravel	0.18	
%Sand	99.11	
%Silt & Clay	0.72	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	111.80	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	111.80	100.00	0.00	Little	11-21%
4	0.1870	0.20	111.60	99.82	0.18	Some	21-36%
6	0.1320	0.20	111.40	99.64	0.36	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.50	110.90	99.19	0.81		
12	0.0661	0.50	110.40	98.75	1.25	"and" (ie: gravel and sand)	45-50%
20	0.0331	12.70	97.70	87.39	12.61		
40	0.0165	33.60	64.10	57.33	42.67		
50	0.0117	21.20	42.90	38.37	61.63		
80	0.0070	27.30	15.60	13.95	86.05		
200	0.0029	14.80	0.80	0.72	99.28		
Pan	0.0000	0.80	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	59.7-63.5	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	111.00	100.00	0.00
3/4-inch	0.7500	0.00	111.00	100.00	0.00
4	0.1870	0.00	111.00	100.00	0.00
6	0.1320	0.20	110.80	99.82	0.18
8	0.0940				
10	0.0787	0.80	110.00	99.10	0.90
12	0.0661	0.70	109.30	98.47	1.53
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	12.70	96.60	87.03	12.97
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	55.90	40.70	36.67	63.33
50	0.0117	19.90	20.80	18.74	81.26
70	0.0080				
80	0.0070	15.80	5.00	4.50	95.50
200	0.0029	4.40	0.60	0.54	99.46
Pan	0	0.60	0.00	0.00	100.00
Total:		111.00			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.90	
% Med. Sand	62.43	
% Fine Sand	36.13	
%Gravel	0.00	
%Sand	99.46	
%Silt & Clay	0.54	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	111.00	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	111.00	100.00	0.00	Little	11-21%
4	0.1870	0.00	111.00	100.00	0.00	Some	21-36%
6	0.1320	0.20	110.80	99.82	0.18	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.80	110.00	99.10	0.90		
12	0.0661	0.70	109.30	98.47	1.53	"and" (ie: gravel and sand)	45-50%
20	0.0331	12.70	96.60	87.03	12.97		
40	0.0165	55.90	40.70	36.67	63.33		
50	0.0117	19.90	20.80	18.74	81.26		
80	0.0070	15.80	5.00	4.50	95.50		
200	0.0029	4.40	0.60	0.54	99.46		
Pan	0.0000	0.60	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE



**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	63.5-65.0	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	109.50	100.00	0.00
3/4-inch	0.7500	0.00	109.50	100.00	0.00
4	0.1870	0.00	109.50	100.00	0.00
6	0.1320	0.00	109.50	100.00	0.00
8	0.0940				
10	0.0787	0.00	109.50	100.00	0.00
12	0.0661	0.00	109.50	100.00	0.00
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	0.20	109.30	99.82	0.18
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	8.60	100.70	91.96	8.04
50	0.0117	24.60	76.10	69.50	30.50
70	0.0080				
80	0.0070	54.70	21.40	19.54	80.46
200	0.0029	20.00	1.40	1.28	98.72
Pan	0	1.40	0.00	0.00	100.00
Total:		109.50			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.00	
% Med. Sand	8.04	
% Fine Sand	90.68	
%Gravel	0.00	
%Sand	98.72	
%Silt & Clay	1.28	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	109.50	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	109.50	100.00	0.00	Little	11-21%
4	0.1870	0.00	109.50	100.00	0.00	Some	21-36%
6	0.1320	0.00	109.50	100.00	0.00	Adjective ending in "y" (ie: silty, sandy, gravelly) "and" (ie: gravel and sand)	36-45%
10	0.0787	0.00	109.50	100.00	0.00		
12	0.0661	0.00	109.50	100.00	0.00		
20	0.0331	0.20	109.30	99.82	0.18		45-50%
40	0.0165	8.60	100.70	91.96	8.04		
50	0.0117	24.60	76.10	69.50	30.50		
80	0.0070	54.70	21.40	19.54	80.46		
200	0.0029	20.00	1.40	1.28	98.72		
Pan	0.0000	1.40	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	65.0-67.4	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	115.90	100.00	0.00
3/4-inch	0.7500	0.00	115.90	100.00	0.00
4	0.1870	0.00	115.90	100.00	0.00
6	0.1320	0.50	115.40	99.57	0.43
8	0.0940				
10	0.0787	2.20	113.20	97.67	2.33
12	0.0661	1.10	112.10	96.72	3.28
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	17.30	94.80	81.79	18.21
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	53.80	41.00	35.38	64.62
50	0.0117	20.50	20.50	17.69	82.31
70	0.0080				
80	0.0070	16.30	4.20	3.62	96.38
200	0.0029	3.90	0.30	0.26	99.74
Pan	0	0.30	0.00	0.00	100.00
Total:		115.90			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	2.33	
% Med. Sand	62.30	
% Fine Sand	35.12	
%Gravel	0.00	
%Sand	99.74	
%Silt & Clay	0.26	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	115.90	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	115.90	100.00	0.00	Little	11-21%
4	0.1870	0.00	115.90	100.00	0.00	Some	21-36%
6	0.1320	0.50	115.40	99.57	0.43	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	2.20	113.20	97.67	2.33		
12	0.0661	1.10	112.10	96.72	3.28	"and" (ie: gravel and sand)	45-50%
20	0.0331	17.30	94.80	81.79	18.21		
40	0.0165	53.80	41.00	35.38	64.62		
50	0.0117	20.50	20.50	17.69	82.31		
80	0.0070	16.30	4.20	3.62	96.38		
200	0.0029	3.90	0.30	0.26	99.74		
Pan	0.0000	0.30	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	75.0-79.6	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	115.60	100.00	0.00
3/4-inch	0.7500	0.00	115.60	100.00	0.00
4	0.1870	3.70	111.90	96.80	3.20
6	0.1320	1.50	110.40	95.50	4.50
8	0.0940				
10	0.0787	3.80	106.60	92.21	7.79
12	0.0661	2.10	104.50	90.40	9.60
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	18.70	85.80	74.22	25.78
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	45.20	40.60	35.12	64.88
50	0.0117	18.60	22.00	19.03	80.97
70	0.0080				
80	0.0070	16.10	5.90	5.10	94.90
200	0.0029	5.00	0.90	0.78	99.22
Pan	0	0.90	0.00	0.00	100.00
Total:		115.60			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	3.20	
% Coarse Sand	4.58	
% Med. Sand	57.09	
% Fine Sand	34.34	
%Gravel	3.20	
%Sand	96.02	
%Silt & Clay	0.78	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	115.60	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	115.60	100.00	0.00	Little	11-21%
4	0.1870	3.70	111.90	96.80	3.20	Some	21-36%
6	0.1320	1.50	110.40	95.50	4.50	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	3.80	106.60	92.21	7.79		
12	0.0661	2.10	104.50	90.40	9.60	"and" (ie: gravel and sand)	45-50%
20	0.0331	18.70	85.80	74.22	25.78		
40	0.0165	45.20	40.60	35.12	64.88		
50	0.0117	18.60	22.00	19.03	80.97		
80	0.0070	16.10	5.90	5.10	94.90		
200	0.0029	5.00	0.90	0.78	99.22		
Pan	0.0000	0.90	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	79.6-82.4 and 84.0-85.8	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	115.80	100.00	0.00
3/4-inch	0.7500	0.00	115.80	100.00	0.00
4	0.1870	2.00	113.80	98.27	1.73
6	0.1320	1.70	112.10	96.80	3.20
8	0.0940				
10	0.0787	4.20	107.90	93.18	6.82
12	0.0661	2.10	105.80	91.36	8.64
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	27.80	78.00	67.36	32.64
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	49.30	28.70	24.78	75.22
50	0.0117	15.70	13.00	11.23	88.77
70	0.0080				
80	0.0070	9.20	3.80	3.28	96.72
200	0.0029	2.90	0.90	0.78	99.22
Pan	0	0.90	0.00	0.00	100.00
Total:		115.80			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	1.73	
% Coarse Sand	5.09	
% Med. Sand	68.39	
% Fine Sand	24.01	
%Gravel	1.73	
%Sand	97.50	
%Silt & Clay	0.78	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	115.80	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	115.80	100.00	0.00	Little	11-21%
4	0.1870	2.00	113.80	98.27	1.73	Some	21-36%
6	0.1320	1.70	112.10	96.80	3.20	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	4.20	107.90	93.18	6.82		
12	0.0661	2.10	105.80	91.36	8.64	"and" (ie: gravel and sand)	45-50%
20	0.0331	27.80	78.00	67.36	32.64		
40	0.0165	49.30	28.70	24.78	75.22		
50	0.0117	15.70	13.00	11.23	88.77		
80	0.0070	9.20	3.80	3.28	96.72		
200	0.0029	2.90	0.90	0.78	99.22		
Pan	0.0000	0.90	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	82.4-84.0	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	122.30	100.00	0.00
3/4-inch	0.7500	0.00	122.30	100.00	0.00
4	0.1870	39.40	82.90	67.78	32.22
6	0.1320	8.50	74.40	60.83	39.17
8	0.0940				
10	0.0787	12.40	62.00	50.70	49.30
12	0.0661	4.20	57.80	47.26	52.74
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	25.20	32.60	26.66	73.34
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	23.10	9.50	7.77	92.23
50	0.0117	5.10	4.40	3.60	96.40
70	0.0080				
80	0.0070	2.60	1.80	1.47	98.53
200	0.0029	1.00	0.80	0.65	99.35
Pan	0	0.80	0.00	0.00	100.00
Total:		122.30			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	32.22	
% Coarse Sand	17.09	
% Med. Sand	42.93	
% Fine Sand	7.11	
%Gravel	32.22	
%Sand	67.13	
%Silt & Clay	0.65	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	122.30	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	122.30	100.00	0.00	Little	11-21%
4	0.1870	39.40	82.90	67.78	32.22	Some	21-36%
6	0.1320	8.50	74.40	60.83	39.17	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	12.40	62.00	50.70	49.30		
12	0.0661	4.20	57.80	47.26	52.74	"and" (ie: gravel and sand)	45-50%
20	0.0331	25.20	32.60	26.66	73.34		
40	0.0165	23.10	9.50	7.77	92.23		
50	0.0117	5.10	4.40	3.60	96.40		
80	0.0070	2.60	1.80	1.47	98.53		
200	0.0029	1.00	0.80	0.65	99.35		
Pan	0.0000	0.80	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	85.8-90.0	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	116.50	100.00	0.00
3/4-inch	0.7500	0.00	116.50	100.00	0.00
4	0.1870	14.00	102.50	87.98	12.02
6	0.1320	4.80	97.70	83.86	16.14
8	0.0940				
10	0.0787	9.30	88.40	75.88	24.12
12	0.0661	3.00	85.40	73.30	26.70
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	20.50	64.90	55.71	44.29
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	32.40	32.50	27.90	72.10
50	0.0117	12.10	20.40	17.51	82.49
70	0.0080				
80	0.0070	12.90	7.50	6.44	93.56
200	0.0029	6.20	1.30	1.12	98.88
Pan	0	1.30	0.00	0.00	100.00
Total:		116.50			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	12.02	
% Coarse Sand	12.10	
% Med. Sand	47.98	
% Fine Sand	26.78	
%Gravel	12.02	
%Sand	86.87	
%Silt & Clay	1.12	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	116.50	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	116.50	100.00	0.00	Little	11-21%
4	0.1870	14.00	102.50	87.98	12.02	Some	21-36%
6	0.1320	4.80	97.70	83.86	16.14	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	9.30	88.40	75.88	24.12		
12	0.0661	3.00	85.40	73.30	26.70	"and" (ie: gravel and sand)	45-50%
20	0.0331	20.50	64.90	55.71	44.29		
40	0.0165	32.40	32.50	27.90	72.10		
50	0.0117	12.10	20.40	17.51	82.49		
80	0.0070	12.90	7.50	6.44	93.56		
200	0.0029	6.20	1.30	1.12	98.88		
Pan	0.0000	1.30	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	95.0-105.6	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	117.00	100.00	0.00
3/4-inch	0.7500	0.00	117.00	100.00	0.00
4	0.1870	11.70	105.30	90.00	10.00
6	0.1320	3.00	102.30	87.44	12.56
8	0.0940				
10	0.0787	5.50	96.80	82.74	17.26
12	0.0661	2.80	94.00	80.34	19.66
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	21.20	72.80	62.22	37.78
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	41.00	31.80	27.18	72.82
50	0.0117	12.80	19.00	16.24	83.76
70	0.0080				
80	0.0070	11.60	7.40	6.32	93.68
200	0.0029	5.40	2.00	1.71	98.29
Pan	0	2.00	0.00	0.00	100.00
Total:		117.00			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	10.00	
% Coarse Sand	7.26	
% Med. Sand	55.56	
% Fine Sand	25.47	
%Gravel	10.00	
%Sand	88.29	
%Silt & Clay	1.71	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	117.00	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	117.00	100.00	0.00	Little	11-21%
4	0.1870	11.70	105.30	90.00	10.00	Some	21-36%
6	0.1320	3.00	102.30	87.44	12.56	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	5.50	96.80	82.74	17.26		
12	0.0661	2.80	94.00	80.34	19.66	"and" (ie: gravel and sand)	45-50%
20	0.0331	21.20	72.80	62.22	37.78		
40	0.0165	41.00	31.80	27.18	72.82		
50	0.0117	12.80	19.00	16.24	83.76		
80	0.0070	11.60	7.40	6.32	93.68		
200	0.0029	5.40	2.00	1.71	98.29		
Pan	0.0000	2.00	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	105.6-107.8	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	121.40	100.00	0.00
3/4-inch	0.7500	0.00	121.40	100.00	0.00
4	0.1870	22.00	99.40	81.88	18.12
6	0.1320	9.80	89.60	73.81	26.19
8	0.0940				
10	0.0787	13.40	76.20	62.77	37.23
12	0.0661	4.20	72.00	59.31	40.69
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	26.30	45.70	37.64	62.36
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	28.40	17.30	14.25	85.75
50	0.0117	7.10	10.20	8.40	91.60
70	0.0080				
80	0.0070	4.70	5.50	4.53	95.47
200	0.0029	2.70	2.80	2.31	97.69
Pan	0	2.80	0.00	0.00	100.00
Total:		121.40			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	18.12	
% Coarse Sand	19.11	
% Med. Sand	48.52	
% Fine Sand	11.94	
%Gravel	18.12	
%Sand	79.57	
%Silt & Clay	2.31	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	121.40	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	121.40	100.00	0.00	Little	11-21%
4	0.1870	22.00	99.40	81.88	18.12	Some	21-36%
6	0.1320	9.80	89.60	73.81	26.19	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	13.40	76.20	62.77	37.23		
12	0.0661	4.20	72.00	59.31	40.69	"and" (ie: gravel and sand)	45-50%
20	0.0331	26.30	45.70	37.64	62.36		
40	0.0165	28.40	17.30	14.25	85.75		
50	0.0117	7.10	10.20	8.40	91.60		
80	0.0070	4.70	5.50	4.53	95.47		
200	0.0029	2.70	2.80	2.31	97.69		
Pan	0.0000	2.80	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE



**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	115.0-117.6	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	129.50	100.00	0.00
3/4-inch	0.7500	14.80	114.70	88.57	11.43
4	0.1870	63.60	51.10	39.46	60.54
6	0.1320	7.10	44.00	33.98	66.02
8	0.0940				
10	0.0787	8.80	35.20	27.18	72.82
12	0.0661	2.60	32.60	25.17	74.83
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	12.40	20.20	15.60	84.40
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	10.30	9.90	7.64	92.36
50	0.0117	0.10	9.80	7.57	92.43
70	0.0080				
80	0.0070	0.80	9.00	6.95	93.05
200	0.0029	3.20	5.80	4.48	95.52
Pan	0	5.80	0.00	0.00	100.00
Total:		129.50			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	11.43	
% Fine Gravel	49.11	
% Coarse Sand	12.28	
% Med. Sand	19.54	
% Fine Sand	3.17	
%Gravel	60.54	
%Sand	34.98	
%Silt & Clay	4.48	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	129.50	100.00	0.00	Trace	<11%
3/4-inch	0.7500	14.80	114.70	88.57	11.43	Little	11-21%
4	0.1870	63.60	51.10	39.46	60.54	Some	21-36%
6	0.1320	7.10	44.00	33.98	66.02	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	8.80	35.20	27.18	72.82		
12	0.0661	2.60	32.60	25.17	74.83	"and" (ie: gravel and sand)	45-50%
20	0.0331	12.40	20.20	15.60	84.40		
40	0.0165	10.30	9.90	7.64	92.36		
50	0.0117	0.10	9.80	7.57	92.43		
80	0.0070	0.80	9.00	6.95	93.05		
200	0.0029	3.20	5.80	4.48	95.52		
Pan	0.0000	5.80	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	117.6-119.7	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	113.90	100.00	0.00
3/4-inch	0.7500	0.00	113.90	100.00	0.00
4	0.1870	2.20	111.70	98.07	1.93
6	0.1320	1.70	110.00	96.58	3.42
8	0.0940				
10	0.0787	3.10	106.90	93.85	6.15
12	0.0661	1.80	105.10	92.27	7.73
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	13.10	92.00	80.77	19.23
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	28.50	63.50	55.75	44.25
50	0.0117	13.00	50.50	44.34	55.66
70	0.0080				
80	0.0070	20.20	30.30	26.60	73.40
200	0.0029	20.20	10.10	8.87	91.13
Pan	0	10.10	0.00	0.00	100.00
Total:		113.90			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	1.93	
% Coarse Sand	4.21	
% Med. Sand	38.10	
% Fine Sand	46.88	
%Gravel	1.93	
%Sand	89.20	
%Silt & Clay	8.87	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	113.90	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	113.90	100.00	0.00	Little	11-21%
4	0.1870	2.20	111.70	98.07	1.93	Some	21-36%
6	0.1320	1.70	110.00	96.58	3.42	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	3.10	106.90	93.85	6.15		
12	0.0661	1.80	105.10	92.27	7.73	"and" (ie: gravel and sand)	45-50%
20	0.0331	13.10	92.00	80.77	19.23		
40	0.0165	28.50	63.50	55.75	44.25		
50	0.0117	13.00	50.50	44.34	55.66		
80	0.0070	20.20	30.30	26.60	73.40		
200	0.0029	20.20	10.10	8.87	91.13		
Pan	0.0000	10.10	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	119.7-132.0 and 135.0-140.0	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	113.20	100.00	0.00
3/4-inch	0.7500	0.00	113.20	100.00	0.00
4	0.1870	1.20	112.00	98.94	1.06
6	0.1320	0.10	111.90	98.85	1.15
8	0.0940				
10	0.0787	1.00	110.90	97.97	2.03
12	0.0661	0.40	110.50	97.61	2.39
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	4.00	106.50	94.08	5.92
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	24.10	82.40	72.79	27.21
50	0.0117	16.50	65.90	58.22	41.78
70	0.0080				
80	0.0070	19.50	46.40	40.99	59.01
200	0.0029	33.70	12.70	11.22	88.78
Pan	0	12.70	0.00	0.00	100.00
Total:		113.20			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	1.06	
% Coarse Sand	0.97	
% Med. Sand	25.18	
% Fine Sand	61.57	
%Gravel	1.06	
%Sand	87.72	
%Silt & Clay	11.22	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	113.20	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	113.20	100.00	0.00	Little	11-21%
4	0.1870	1.20	112.00	98.94	1.06	Some	21-36%
6	0.1320	0.10	111.90	98.85	1.15	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	1.00	110.90	97.97	2.03		
12	0.0661	0.40	110.50	97.61	2.39	"and" (ie: gravel and sand)	45-50%
20	0.0331	4.00	106.50	94.08	5.92		
40	0.0165	24.10	82.40	72.79	27.21		
50	0.0117	16.50	65.90	58.22	41.78		
80	0.0070	19.50	46.40	40.99	59.01		
200	0.0029	33.70	12.70	11.22	88.78		
Pan	0.0000	12.70	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	140.0-152.2	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	114.70	100.00	0.00
3/4-inch	0.7500	0.00	114.70	100.00	0.00
4	0.1870	0.00	114.70	100.00	0.00
6	0.1320	0.00	114.70	100.00	0.00
8	0.0940				
10	0.0787	0.40	114.30	99.65	0.35
12	0.0661	0.20	114.10	99.48	0.52
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	10.20	103.90	90.58	9.42
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	49.00	54.90	47.86	52.14
50	0.0117	24.50	30.40	26.50	73.50
70	0.0080				
80	0.0070	17.40	13.00	11.33	88.67
200	0.0029	11.00	2.00	1.74	98.26
Pan	0	2.00	0.00	0.00	100.00
Total:		114.70			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.35	
% Med. Sand	51.79	
% Fine Sand	46.12	
%Gravel	0.00	
%Sand	98.26	
%Silt & Clay	1.74	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	114.70	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	114.70	100.00	0.00	Little	11-21%
4	0.1870	0.00	114.70	100.00	0.00	Some	21-36%
6	0.1320	0.00	114.70	100.00	0.00	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.40	114.30	99.65	0.35		
12	0.0661	0.20	114.10	99.48	0.52	"and" (ie: gravel and sand)	45-50%
20	0.0331	10.20	103.90	90.58	9.42		
40	0.0165	49.00	54.90	47.86	52.14		
50	0.0117	24.50	30.40	26.50	73.50		
80	0.0070	17.40	13.00	11.33	88.67		
200	0.0029	11.00	2.00	1.74	98.26		
Pan	0.0000	2.00	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	152.3-154.2	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	114.90	100.00	0.00
3/4-inch	0.7500	0.00	114.90	100.00	0.00
4	0.1870	0.00	114.90	100.00	0.00
6	0.1320	0.00	114.90	100.00	0.00
8	0.0940				
10	0.0787	0.00	114.90	100.00	0.00
12	0.0661	0.00	114.90	100.00	0.00
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	2.30	112.60	98.00	2.00
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	28.70	83.90	73.02	26.98
50	0.0117	29.30	54.60	47.52	52.48
70	0.0080				
80	0.0070	27.20	27.40	23.85	76.15
200	0.0029	20.50	6.90	6.01	93.99
Pan	0	6.90	0.00	0.00	100.00
Total:		114.90			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.00	
% Med. Sand	26.98	
% Fine Sand	67.01	
%Gravel	0.00	
%Sand	93.99	
%Silt & Clay	6.01	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	114.90	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	114.90	100.00	0.00	Little	11-21%
4	0.1870	0.00	114.90	100.00	0.00	Some	21-36%
6	0.1320	0.00	114.90	100.00	0.00	Adjective ending in "y" (ie: silty, sandy, gravelly) "and"	36-45%
10	0.0787	0.00	114.90	100.00	0.00		
12	0.0661	0.00	114.90	100.00	0.00		
20	0.0331	2.30	112.60	98.00	2.00	(ie: gravel and sand)	45-50%
40	0.0165	28.70	83.90	73.02	26.98		
50	0.0117	29.30	54.60	47.52	52.48		
80	0.0070	27.20	27.40	23.85	76.15		
200	0.0029	20.50	6.90	6.01	93.99		
Pan	0.0000	6.90	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	155.0-162.7	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	118.20	100.00	0.00
3/4-inch	0.7500	0.00	118.20	100.00	0.00
4	0.1870	2.50	115.70	97.88	2.12
6	0.1320	2.20	113.50	96.02	3.98
8	0.0940				
10	0.0787	5.60	107.90	91.29	8.71
12	0.0661	3.90	104.00	87.99	12.01
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	26.90	77.10	65.23	34.77
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	36.80	40.30	34.09	65.91
50	0.0117	15.30	25.00	21.15	78.85
70	0.0080				
80	0.0070	16.70	8.30	7.02	92.98
200	0.0029	5.70	2.60	2.20	97.80
Pan	0	2.60	0.00	0.00	100.00
Total:		118.20			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	2.12	
% Coarse Sand	6.60	
% Med. Sand	57.19	
% Fine Sand	31.90	
%Gravel	2.12	
%Sand	95.69	
%Silt & Clay	2.20	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	118.20	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	118.20	100.00	0.00	Little	11-21%
4	0.1870	2.50	115.70	97.88	2.12	Some	21-36%
6	0.1320	2.20	113.50	96.02	3.98	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	5.60	107.90	91.29	8.71		
12	0.0661	3.90	104.00	87.99	12.01	"and" (ie: gravel and sand)	45-50%
20	0.0331	26.90	77.10	65.23	34.77		
40	0.0165	36.80	40.30	34.09	65.91		
50	0.0117	15.30	25.00	21.15	78.85		
80	0.0070	16.70	8.30	7.02	92.98		
200	0.0029	5.70	2.60	2.20	97.80		
Pan	0.0000	2.60	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	162.7-167.5	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	113.10	100.00	0.00
3/4-inch	0.7500	0.00	113.10	100.00	0.00
4	0.1870	0.00	113.10	100.00	0.00
6	0.1320	0.40	112.70	99.65	0.35
8	0.0940				
10	0.0787	2.30	110.40	97.61	2.39
12	0.0661	1.00	109.40	96.73	3.27
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	10.00	99.40	87.89	12.11
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	36.50	62.90	55.61	44.39
50	0.0117	29.70	33.20	29.35	70.65
70	0.0080				
80	0.0070	25.80	7.40	6.54	93.46
200	0.0029	5.80	1.60	1.41	98.59
Pan	0	1.60	0.00	0.00	100.00
Total:		113.10			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	2.39	
% Med. Sand	42.00	
% Fine Sand	54.20	
%Gravel	0.00	
%Sand	98.59	
%Silt & Clay	1.41	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	113.10	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	113.10	100.00	0.00	Little	11-21%
4	0.1870	0.00	113.10	100.00	0.00	Some	21-36%
6	0.1320	0.40	112.70	99.65	0.35	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	2.30	110.40	97.61	2.39		
12	0.0661	1.00	109.40	96.73	3.27	"and" (ie: gravel and sand)	45-50%
20	0.0331	10.00	99.40	87.89	12.11		
40	0.0165	36.50	62.90	55.61	44.39		
50	0.0117	29.70	33.20	29.35	70.65		
80	0.0070	25.80	7.40	6.54	93.46		
200	0.0029	5.80	1.60	1.41	98.59		
Pan	0.0000	1.60	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	167.5-169.4	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	73.20	100.00	0.00
3/4-inch	0.7500	0.00	73.20	100.00	0.00
4	0.1870	0.00	73.20	100.00	0.00
6	0.1320	0.00	73.20	100.00	0.00
8	0.0940				
10	0.0787	0.00	73.20	100.00	0.00
12	0.0661	0.10	73.10	99.86	0.14
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	0.10	73.00	99.73	0.27
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	15.10	57.90	79.10	20.90
50	0.0117	19.10	38.80	53.01	46.99
70	0.0080				
80	0.0070	16.40	22.40	30.60	69.40
200	0.0029	17.70	4.70	6.42	93.58
Pan	0	4.70	0.00	0.00	100.00
Total:		73.20			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.00	
% Med. Sand	20.90	
% Fine Sand	72.68	
%Gravel	0.00	
%Sand	93.58	
%Silt & Clay	6.42	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	73.20	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	73.20	100.00	0.00	Little	11-21%
4	0.1870	0.00	73.20	100.00	0.00	Some	21-36%
6	0.1320	0.00	73.20	100.00	0.00	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.00	73.20	100.00	0.00		
12	0.0661	0.10	73.10	99.86	0.14	"and" (ie: gravel and sand)	45-50%
20	0.0331	0.10	73.00	99.73	0.27		
40	0.0165	15.10	57.90	79.10	20.90		
50	0.0117	19.10	38.80	53.01	46.99		
80	0.0070	16.40	22.40	30.60	69.40		
200	0.0029	17.70	4.70	6.42	93.58		
Pan	0.0000	4.70	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE



**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	169.8-173.0	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	72.00	100.00	0.00
3/4-inch	0.7500	0.00	72.00	100.00	0.00
4	0.1870	0.30	71.70	99.58	0.42
6	0.1320	0.00	71.70	99.58	0.42
8	0.0940				
10	0.0787	0.10	71.60	99.44	0.56
12	0.0661	0.00	71.60	99.44	0.56
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	0.10	71.50	99.31	0.69
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	0.10	71.40	99.17	0.83
50	0.0117	0.40	71.00	98.61	1.39
70	0.0080				
80	0.0070	9.50	61.50	85.42	14.58
200	0.0029	27.30	34.20	47.50	52.50
Pan	0	34.20	0.00	0.00	100.00
Total:		72.00			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.42	
% Coarse Sand	0.14	
% Med. Sand	0.28	
% Fine Sand	51.67	
%Gravel	0.42	
%Sand	52.08	
%Silt & Clay	47.50	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	72.00	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	72.00	100.00	0.00	Little	11-21%
4	0.1870	0.30	71.70	99.58	0.42	Some	21-36%
6	0.1320	0.00	71.70	99.58	0.42	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.10	71.60	99.44	0.56		
12	0.0661	0.00	71.60	99.44	0.56	"and" (ie: gravel and sand)	45-50%
20	0.0331	0.10	71.50	99.31	0.69		
40	0.0165	0.10	71.40	99.17	0.83		
50	0.0117	0.40	71.00	98.61	1.39		
80	0.0070	9.50	61.50	85.42	14.58		
200	0.0029	27.30	34.20	47.50	52.50		
Pan	0.0000	34.20	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	173.0-175.0	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	77.80	100.00	0.00
3/4-inch	0.7500	0.00	77.80	100.00	0.00
4	0.1870	0.30	77.50	99.61	0.39
6	0.1320	0.40	77.10	99.10	0.90
8	0.0940				
10	0.0787	0.70	76.40	98.20	1.80
12	0.0661	0.20	76.20	97.94	2.06
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	2.70	73.50	94.47	5.53
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	16.30	57.20	73.52	26.48
50	0.0117	13.00	44.20	56.81	43.19
70	0.0080				
80	0.0070	13.70	30.50	39.20	60.80
200	0.0029	14.20	16.30	20.95	79.05
Pan	0	16.30	0.00	0.00	100.00
Total:		77.80			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.39	
% Coarse Sand	1.41	
% Med. Sand	24.68	
% Fine Sand	52.57	
%Gravel	0.39	
%Sand	78.66	
%Silt & Clay	20.95	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	77.80	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	77.80	100.00	0.00	Little	11-21%
4	0.1870	0.30	77.50	99.61	0.39	Some	21-36%
6	0.1320	0.40	77.10	99.10	0.90	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.70	76.40	98.20	1.80		
12	0.0661	0.20	76.20	97.94	2.06	"and" (ie: gravel and sand)	45-50%
20	0.0331	2.70	73.50	94.47	5.53		
40	0.0165	16.30	57.20	73.52	26.48		
50	0.0117	13.00	44.20	56.81	43.19		
80	0.0070	13.70	30.50	39.20	60.80		
200	0.0029	14.20	16.30	20.95	79.05		
Pan	0.0000	16.30	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	175.0-176.5	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	61.10	100.00	0.00
3/4-inch	0.7500	0.00	61.10	100.00	0.00
4	0.1870	2.20	58.90	96.40	3.60
6	0.1320	0.00	58.90	96.40	3.60
8	0.0940				
10	0.0787	0.10	58.80	96.24	3.76
12	0.0661	0.00	58.80	96.24	3.76
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	0.00	58.80	96.24	3.76
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	1.30	57.50	94.11	5.89
50	0.0117	3.30	54.20	88.71	11.29
70	0.0080				
80	0.0070	12.20	42.00	68.74	31.26
200	0.0029	16.40	25.60	41.90	58.10
Pan	0	25.60	0.00	0.00	100.00
Total:		61.10			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	3.60	
% Coarse Sand	0.16	
% Med. Sand	2.13	
% Fine Sand	52.21	
%Gravel	3.60	
%Sand	54.50	
%Silt & Clay	41.90	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	61.10	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	61.10	100.00	0.00	Little	11-21%
4	0.1870	2.20	58.90	96.40	3.60	Some	21-36%
6	0.1320	0.00	58.90	96.40	3.60	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.10	58.80	96.24	3.76		
12	0.0661	0.00	58.80	96.24	3.76	"and" (ie: gravel and sand)	45-50%
20	0.0331	0.00	58.80	96.24	3.76		
40	0.0165	1.30	57.50	94.11	5.89		
50	0.0117	3.30	54.20	88.71	11.29		
80	0.0070	12.20	42.00	68.74	31.26		
200	0.0029	16.40	25.60	41.90	58.10		
Pan	0.0000	25.60	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	176.5-189.0	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	59.80	100.00	0.00
3/4-inch	0.7500	0.00	59.80	100.00	0.00
4	0.1870	0.00	59.80	100.00	0.00
6	0.1320	0.10	59.70	99.83	0.17
8	0.0940				
10	0.0787	0.00	59.70	99.83	0.17
12	0.0661	0.00	59.70	99.83	0.17
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	0.00	59.70	99.83	0.17
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	0.00	59.70	99.83	0.17
50	0.0117	0.00	59.70	99.83	0.17
70	0.0080				
80	0.0070	2.60	57.10	95.48	4.52
200	0.0029	20.20	36.90	61.71	38.29
Pan	0	36.90	0.00	0.00	100.00
Total:		59.80			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.17	
% Med. Sand	0.00	
% Fine Sand	38.13	
%Gravel	0.00	
%Sand	38.29	
%Silt & Clay	61.71	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	59.80	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	59.80	100.00	0.00	Little	11-21%
4	0.1870	0.00	59.80	100.00	0.00	Some	21-36%
6	0.1320	0.10	59.70	99.83	0.17	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.00	59.70	99.83	0.17		
12	0.0661	0.00	59.70	99.83	0.17	"and" (ie: gravel and sand)	45-50%
20	0.0331	0.00	59.70	99.83	0.17		
40	0.0165	0.00	59.70	99.83	0.17		
50	0.0117	0.00	59.70	99.83	0.17		
80	0.0070	2.60	57.10	95.48	4.52		
200	0.0029	20.20	36.90	61.71	38.29		
Pan	0.0000	36.90	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	189.0-201.4	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	62.10	100.00	0.00
3/4-inch	0.7500	0.00	62.10	100.00	0.00
4	0.1870	7.00	55.10	88.73	11.27
6	0.1320	0.10	55.00	88.57	11.43
8	0.0940				
10	0.0787	0.00	55.00	88.57	11.43
12	0.0661	0.00	55.00	88.57	11.43
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	0.00	55.00	88.57	11.43
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	0.00	55.00	88.57	11.43
50	0.0117	0.00	55.00	88.57	11.43
70	0.0080				
80	0.0070	2.20	52.80	85.02	14.98
200	0.0029	20.00	32.80	52.82	47.18
Pan	0	32.80	0.00	0.00	100.00
Total:		62.10			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	11.27	
% Coarse Sand	0.16	
% Med. Sand	0.00	
% Fine Sand	35.75	
%Gravel	11.27	
%Sand	35.91	
%Silt & Clay	52.82	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	62.10	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	62.10	100.00	0.00	Little	11-21%
4	0.1870	7.00	55.10	88.73	11.27	Some	21-36%
6	0.1320	0.10	55.00	88.57	11.43	Adjective ending in "y" (ie: silty, sandy, gravelly) "and" (ie: gravel and sand)	36-45%
10	0.0787	0.00	55.00	88.57	11.43		
12	0.0661	0.00	55.00	88.57	11.43		
20	0.0331	0.00	55.00	88.57	11.43		
40	0.0165	0.00	55.00	88.57	11.43		
50	0.0117	0.00	55.00	88.57	11.43		
80	0.0070	2.20	52.80	85.02	14.98		
200	0.0029	20.00	32.80	52.82	47.18		
Pan	0.0000	32.80	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	202.2-205	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	102.20	100.00	0.00
3/4-inch	0.7500	0.00	102.20	100.00	0.00
4	0.1870	0.00	102.20	100.00	0.00
6	0.1320	0.00	102.20	100.00	0.00
8	0.0940				
10	0.0787	0.00	102.20	100.00	0.00
12	0.0661	0.00	102.20	100.00	0.00
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	0.00	102.20	100.00	0.00
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	0.00	102.20	100.00	0.00
50	0.0117	0.00	102.20	100.00	0.00
70	0.0080				
80	0.0070	0.40	101.80	99.61	0.39
200	0.0029	41.70	60.10	58.81	41.19
Pan	0	60.10	0.00	0.00	100.00
Total:		102.20			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.00	
% Med. Sand	0.00	
% Fine Sand	41.19	
%Gravel	0.00	
%Sand	41.19	
%Silt & Clay	58.81	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	102.20	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	102.20	100.00	0.00	Little	11-21%
4	0.1870	0.00	102.20	100.00	0.00	Some	21-36%
6	0.1320	0.00	102.20	100.00	0.00	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.00	102.20	100.00	0.00		
12	0.0661	0.00	102.20	100.00	0.00	"and" (ie: gravel and sand)	45-50%
20	0.0331	0.00	102.20	100.00	0.00		
40	0.0165	0.00	102.20	100.00	0.00		
50	0.0117	0.00	102.20	100.00	0.00		
80	0.0070	0.40	101.80	99.61	0.39		
200	0.0029	41.70	60.10	58.81	41.19		
Pan	0.0000	60.10	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	205-221.7	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	67.90	100.00	0.00
3/4-inch	0.7500	0.00	67.90	100.00	0.00
4	0.1870	0.00	67.90	100.00	0.00
6	0.1320	0.00	67.90	100.00	0.00
8	0.0940				
10	0.0787	0.00	67.90	100.00	0.00
12	0.0661	0.00	67.90	100.00	0.00
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	0.00	67.90	100.00	0.00
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	0.00	67.90	100.00	0.00
50	0.0117	0.40	67.50	99.41	0.59
70	0.0080				
80	0.0070	0.10	67.40	99.26	0.74
200	0.0029	13.90	53.50	78.79	21.21
Pan	0	53.50	0.00	0.00	100.00
Total:		67.90			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.00	
% Med. Sand	0.00	
% Fine Sand	21.21	
%Gravel	0.00	
%Sand	21.21	
%Silt & Clay	78.79	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	67.90	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	67.90	100.00	0.00	Little	11-21%
4	0.1870	0.00	67.90	100.00	0.00	Some	21-36%
6	0.1320	0.00	67.90	100.00	0.00	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.00	67.90	100.00	0.00		
12	0.0661	0.00	67.90	100.00	0.00	"and" (ie: gravel and sand)	45-50%
20	0.0331	0.00	67.90	100.00	0.00		
40	0.0165	0.00	67.90	100.00	0.00		
50	0.0117	0.40	67.50	99.41	0.59		
80	0.0070	0.10	67.40	99.26	0.74		
200	0.0029	13.90	53.50	78.79	21.21		
Pan	0.0000	53.50	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	221.7-223	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	109.90	100.00	0.00
3/4-inch	0.7500	0.00	109.90	100.00	0.00
4	0.1870	0.00	109.90	100.00	0.00
6	0.1320	0.00	109.90	100.00	0.00
8	0.0940				
10	0.0787	0.00	109.90	100.00	0.00
12	0.0661	0.00	109.90	100.00	0.00
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	0.00	109.90	100.00	0.00
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	0.00	109.90	100.00	0.00
50	0.0117	0.00	109.90	100.00	0.00
70	0.0080				
80	0.0070	2.50	107.40	97.73	2.27
200	0.0029	80.10	27.30	24.84	75.16
Pan	0	27.30	0.00	0.00	100.00
Total:		109.90			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	0.00	
% Med. Sand	0.00	
% Fine Sand	75.16	
%Gravel	0.00	
%Sand	75.16	
%Silt & Clay	24.84	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	109.90	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	109.90	100.00	0.00	Little	11-21%
4	0.1870	0.00	109.90	100.00	0.00	Some	21-36%
6	0.1320	0.00	109.90	100.00	0.00	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.00	109.90	100.00	0.00		
12	0.0661	0.00	109.90	100.00	0.00	"and" (ie: gravel and sand)	45-50%
20	0.0331	0.00	109.90	100.00	0.00		
40	0.0165	0.00	109.90	100.00	0.00		
50	0.0117	0.00	109.90	100.00	0.00		
80	0.0070	2.50	107.40	97.73	2.27		
200	0.0029	80.10	27.30	24.84	75.16		
Pan	0.0000	27.30	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE



**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	225-232.7	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	106.50	100.00	0.00
3/4-inch	0.7500	0.00	106.50	100.00	0.00
4	0.1870	4.50	102.00	95.77	4.23
6	0.1320	0.30	101.70	95.49	4.51
8	0.0940				
10	0.0787	0.60	101.10	94.93	5.07
12	0.0661	0.20	100.90	94.74	5.26
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	3.90	97.00	91.08	8.92
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	24.50	72.50	68.08	31.92
50	0.0117	22.60	49.90	46.85	53.15
70	0.0080				
80	0.0070	26.10	23.80	22.35	77.65
200	0.0029	16.90	6.90	6.48	93.52
Pan	0	6.90	0.00	0.00	100.00
Total:		106.50			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	4.23	
% Coarse Sand	0.85	
% Med. Sand	26.85	
% Fine Sand	61.60	
%Gravel	4.23	
%Sand	89.30	
%Silt & Clay	6.48	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	106.50	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	106.50	100.00	0.00	Little	11-21%
4	0.1870	4.50	102.00	95.77	4.23	Some	21-36%
6	0.1320	0.30	101.70	95.49	4.51	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.60	101.10	94.93	5.07		
12	0.0661	0.20	100.90	94.74	5.26	"and" (ie: gravel and sand)	45-50%
20	0.0331	3.90	97.00	91.08	8.92		
40	0.0165	24.50	72.50	68.08	31.92		
50	0.0117	22.60	49.90	46.85	53.15		
80	0.0070	26.10	23.80	22.35	77.65		
200	0.0029	16.90	6.90	6.48	93.52		
Pan	0.0000	6.90	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	232.7-235.7	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	112.00	100.00	0.00
3/4-inch	0.7500	0.00	112.00	100.00	0.00
4	0.1870	0.00	112.00	100.00	0.00
6	0.1320	0.40	111.60	99.64	0.36
8	0.0940				
10	0.0787	0.80	110.80	98.93	1.07
12	0.0661	0.30	110.50	98.66	1.34
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	4.10	106.40	95.00	5.00
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	23.10	83.30	74.38	25.63
50	0.0117	18.60	64.70	57.77	42.23
70	0.0080				
80	0.0070	27.50	37.20	33.21	66.79
200	0.0029	22.30	14.90	13.30	86.70
Pan	0	14.90	0.00	0.00	100.00
Total:		112.00			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	0.00	
% Coarse Sand	1.07	
% Med. Sand	24.55	
% Fine Sand	61.07	
%Gravel	0.00	
%Sand	86.70	
%Silt & Clay	13.30	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	112.00	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	112.00	100.00	0.00	Little	11-21%
4	0.1870	0.00	112.00	100.00	0.00	Some	21-36%
6	0.1320	0.40	111.60	99.64	0.36	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	0.80	110.80	98.93	1.07		
12	0.0661	0.30	110.50	98.66	1.34	"and" (ie: gravel and sand)	45-50%
20	0.0331	4.10	106.40	95.00	5.00		
40	0.0165	23.10	83.30	74.38	25.63		
50	0.0117	18.60	64.70	57.77	42.23		
80	0.0070	27.50	37.20	33.21	66.79		
200	0.0029	22.30	14.90	13.30	86.70		
Pan	0.0000	14.90	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	238.1-241.3	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	114.90	100.00	0.00
3/4-inch	0.7500	0.00	114.90	100.00	0.00
4	0.1870	3.50	111.40	96.95	3.05
6	0.1320	1.30	110.10	95.82	4.18
8	0.0940				
10	0.0787	2.40	107.70	93.73	6.27
12	0.0661	0.70	107.00	93.12	6.88
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	6.10	100.90	87.82	12.18
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	16.30	84.60	73.63	26.37
50	0.0117	14.70	69.90	60.84	39.16
70	0.0080				
80	0.0070	26.60	43.30	37.68	62.32
200	0.0029	29.50	13.80	12.01	87.99
Pan	0	13.80	0.00	0.00	100.00
Total:		114.90			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	3.05	
% Coarse Sand	3.22	
% Med. Sand	20.10	
% Fine Sand	61.62	
%Gravel	3.05	
%Sand	84.94	
%Silt & Clay	12.01	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	114.90	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	114.90	100.00	0.00	Little	11-21%
4	0.1870	3.50	111.40	96.95	3.05	Some	21-36%
6	0.1320	1.30	110.10	95.82	4.18	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	2.40	107.70	93.73	6.27		
12	0.0661	0.70	107.00	93.12	6.88	"and" (ie: gravel and sand)	45-50%
20	0.0331	6.10	100.90	87.82	12.18		
40	0.0165	16.30	84.60	73.63	26.37		
50	0.0117	14.70	69.90	60.84	39.16		
80	0.0070	26.60	43.30	37.68	62.32		
200	0.0029	29.50	13.80	12.01	87.99		
Pan	0.0000	13.80	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	241.3-243.5	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	117.80	100.00	0.00
3/4-inch	0.7500	0.00	117.80	100.00	0.00
4	0.1870	8.20	109.60	93.04	6.96
6	0.1320	1.80	107.80	91.51	8.49
8	0.0940				
10	0.0787	2.30	105.50	89.56	10.44
12	0.0661	1.00	104.50	88.71	11.29
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	8.60	95.90	81.41	18.59
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	23.60	72.30	61.38	38.62
50	0.0117	17.10	55.20	46.86	53.14
70	0.0080				
80	0.0070	27.30	27.90	23.68	76.32
200	0.0029	19.70	8.20	6.96	93.04
Pan	0	8.20	0.00	0.00	100.00
Total:		117.80			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	6.96	
% Coarse Sand	3.48	
% Med. Sand	28.18	
% Fine Sand	54.41	
%Gravel	6.96	
%Sand	86.08	
%Silt & Clay	6.96	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	117.80	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	117.80	100.00	0.00	Little	11-21%
4	0.1870	8.20	109.60	93.04	6.96	Some	21-36%
6	0.1320	1.80	107.80	91.51	8.49	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	2.30	105.50	89.56	10.44		
12	0.0661	1.00	104.50	88.71	11.29	"and" (ie: gravel and sand)	45-50%
20	0.0331	8.60	95.90	81.41	18.59		
40	0.0165	23.60	72.30	61.38	38.62		
50	0.0117	17.10	55.20	46.86	53.14		
80	0.0070	27.30	27.90	23.68	76.32		
200	0.0029	19.70	8.20	6.96	93.04		
Pan	0.0000	8.20	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE

**Sieve Analysis for USCS Soil Classification Only! Not for Extraction Well Filter Pack Selection!**

Location ID:	69MW0012A	input cells
Sample Depth (feet):	245-246	output cells

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained
1-inch	1.0000	0.00	77.80	100.00	0.00
3/4-inch	0.7500	0.00	77.80	100.00	0.00
4	0.1870	8.10	69.70	89.59	10.41
6	0.1320	1.20	68.50	88.05	11.95
8	0.0940				
10	0.0787	2.00	66.50	85.48	14.52
12	0.0661	0.50	66.00	84.83	15.17
14	0.0560				
16	0.0470				
18	0.0390				
20	0.0331	4.70	61.30	78.79	21.21
25	0.0280				
30	0.0230				
35	0.0200				
40	0.0165	11.30	50.00	64.27	35.73
50	0.0117	8.00	42.00	53.98	46.02
70	0.0080				
80	0.0070	12.30	29.70	38.17	61.83
200	0.0029	13.50	16.20	20.82	79.18
Pan	0	16.20	0.00	0.00	100.00
Total:		77.80			

% Ret.	Grain Size (in)	Estimated Intercept
Form. D90:	0.0098	
Form. D70:	0.0160	
Form. D50:	0.0195	
Form. D40:	0.0220	
D70*4	0.0640	
D50*4	0.0780	
Curvature Coefficient		
1.1874		
Uniformity Coefficient		
2.24		
% Coarse Gravel	0.00	
% Fine Gravel	10.41	
% Coarse Sand	4.11	
% Med. Sand	21.21	
% Fine Sand	43.44	
%Gravel	10.41	
%Sand	68.77	
%Silt & Clay	20.82	

Sieve #	Sieve Size (inches)	Sample Weight (g)	Weight Passed (g)	% Passing	% Retained	CH2M Hill Secondary Constituent Modifiers:	Percentage:
1-inch	1.0000	0.00	77.80	100.00	0.00	Trace	<11%
3/4-inch	0.7500	0.00	77.80	100.00	0.00	Little	11-21%
4	0.1870	8.10	69.70	89.59	10.41	Some	21-36%
6	0.1320	1.20	68.50	88.05	11.95	Adjective ending in "y" (ie: silty, sandy, gravelly)	36-45%
10	0.0787	2.00	66.50	85.48	14.52		
12	0.0661	0.50	66.00	84.83	15.17	"and" (ie: gravel and sand)	45-50%
20	0.0331	4.70	61.30	78.79	21.21		
40	0.0165	11.30	50.00	64.27	35.73		
50	0.0117	8.00	42.00	53.98	46.02		
80	0.0070	12.30	29.70	38.17	61.83		
200	0.0029	13.50	16.20	20.82	79.18		
Pan	0.0000	16.20	0.00	0.00	100.00		

**USCS SOIL CLASSIFICATION:**

GW	GP	GW-GM or GW-GC	GP-GM or GP-GC	GM, GC, or GC-GM	SW	SP	SW-SM or SW-SC	SP-SM or SP-SC	SM, SC, or SC-SM	Silt or Clay
FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE

69PZ0004A



**STL Denver**  
4955 Yarrow Street  
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[www.stl-inc.com](http://www.stl-inc.com)

## **ANALYTICAL REPORT**

2005/10 FS-28 Drilling

Lot #: D6A160207

Trudy Scott

CH2M Hill, Inc  
2525 Airpark Drive  
Redding, CA 96001

**STL DENVER**



**Karen Kuoppala**  
Project Manager

February 8, 2006

## Particle Size of Soils by ASTM D422\_MOD

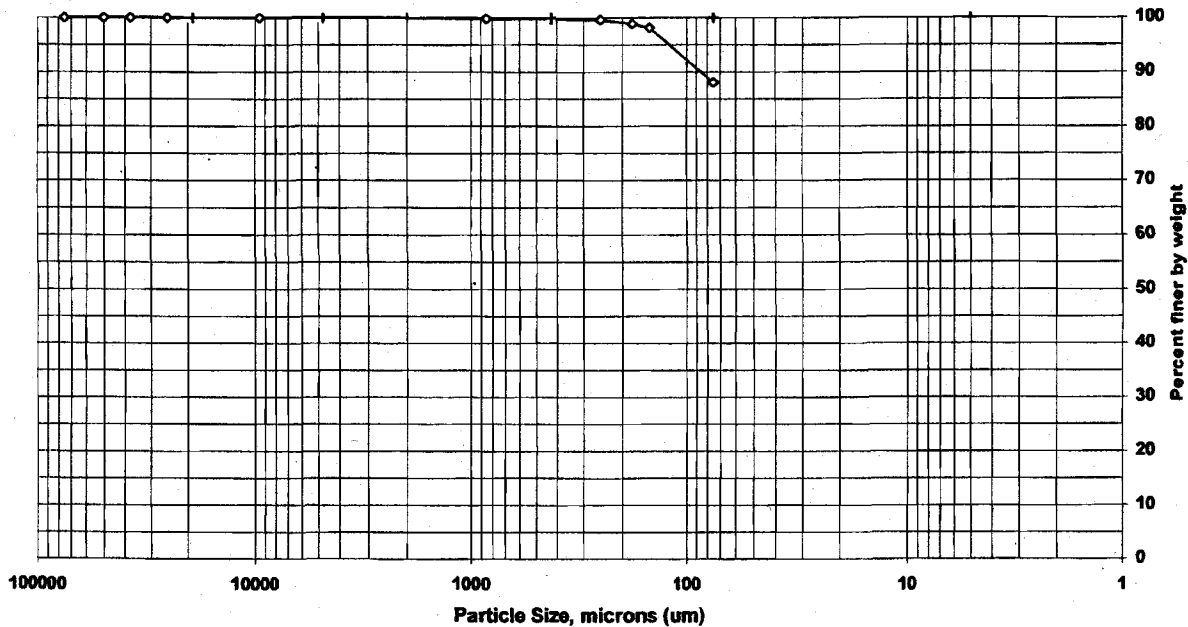
Client Code: STLCOD  
 Sample ID: CHPK0004A00105  
 Lab ID: 654693

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/2/2006

Percent Solids: 80.9%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Med sand

Non-soil material: na  
 Shape (> #10): na  
 Hardness (> #10): na



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.9	0.1
#40	425	99.8	0.1
#60	250	99.6	0.1
#80	180	98.9	0.8
#100	150	98.2	0.7
#200	75	88.1	10.1
Hydrometer	0.0	0.0	88.1
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	11.9
Coarse Sand	0.0
Medium Sand	0.2
Fine Sand	11.7
Silt	88.1
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

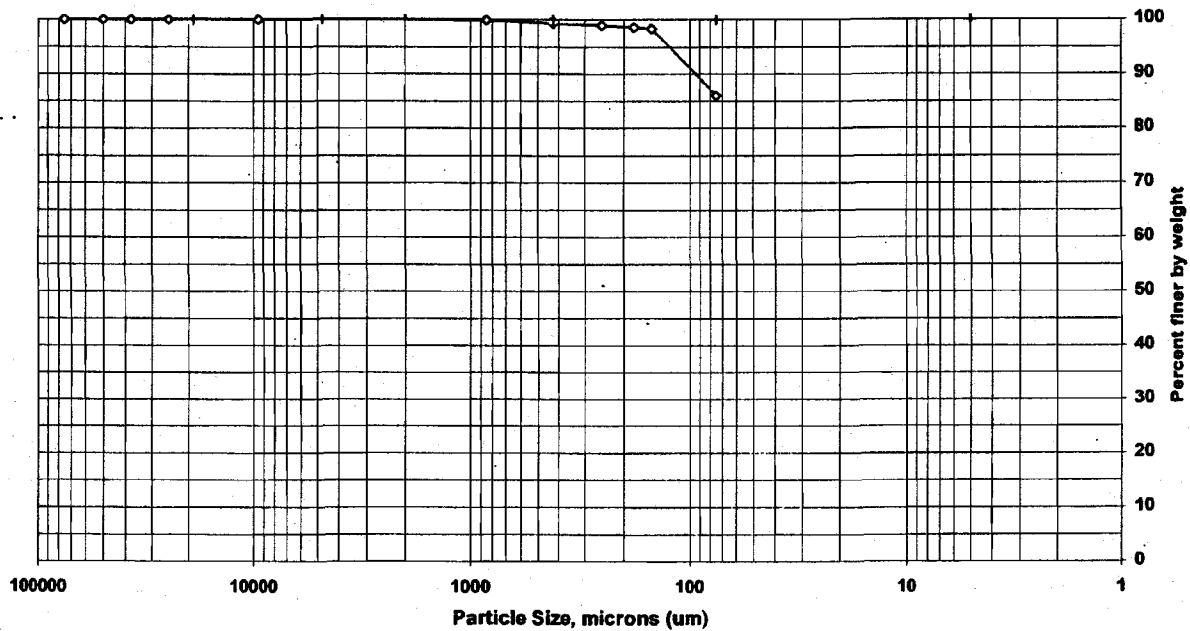
Client Code: STLCOD  
 Sample ID: CHPK0004B00105  
 Lab ID: 654694

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 79.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Med sand

Non-soil material: n/a  
 Shape (> #10): n/a  
 Hardness (> #10): n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.9	0.1
#40	425	99.3	0.6
#60	250	98.9	0.4
#80	180	98.5	0.4
#100	150	98.2	0.3
#200	75	86.0	12.2
Hydrometer	0.0	0.0	86.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	14.0
Coarse Sand	0.0
Medium Sand	0.7
Fine Sand	13.3
Silt	86.0
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute



## Particle Size of Soils by ASTM D422\_MOD

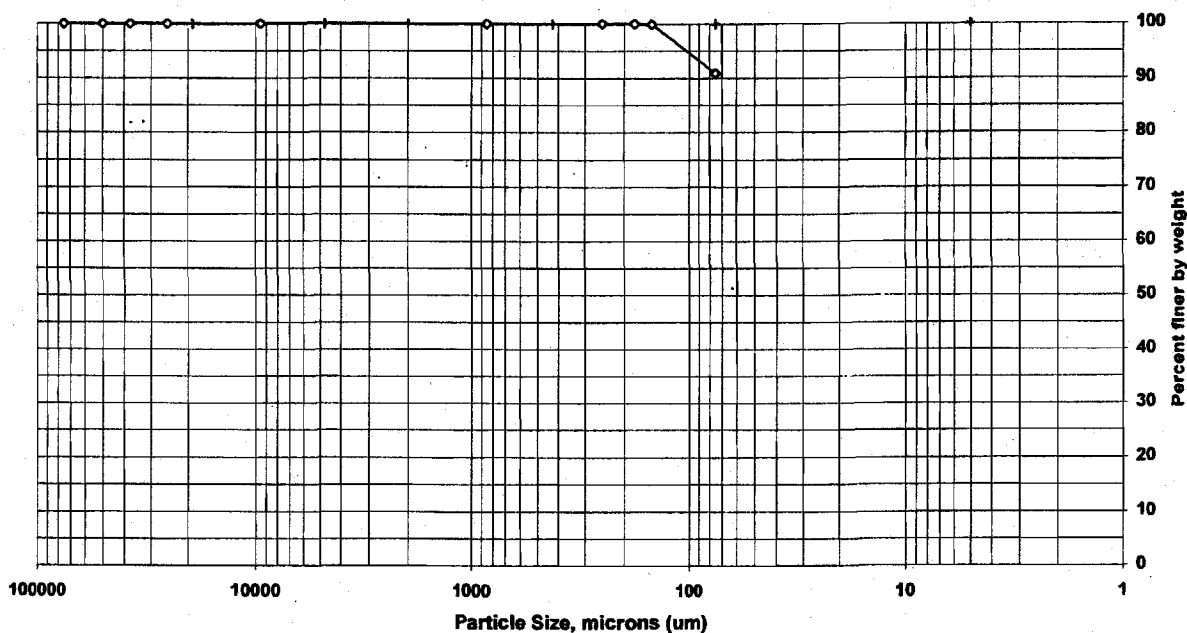
Client Code: STLCOD  
 Sample ID: CHPK0004C00105  
 Lab ID: 654695

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 77.7%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Fine sand

Non-soil material: n/a  
 Shape (> #10): n/a  
 Hardness (> #10): n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	100.0	0.0
#40	425	100.0	0.0
#60	250	100.0	0.0
#80	180	100.0	0.0
#100	150	99.9	0.1
#200	75	90.9	9.0
Hydrometer	0.0	0.0	90.9
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	9.1
Coarse Sand	0.0
Medium Sand	0.0
Fine Sand	9.1
Silt	90.9
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

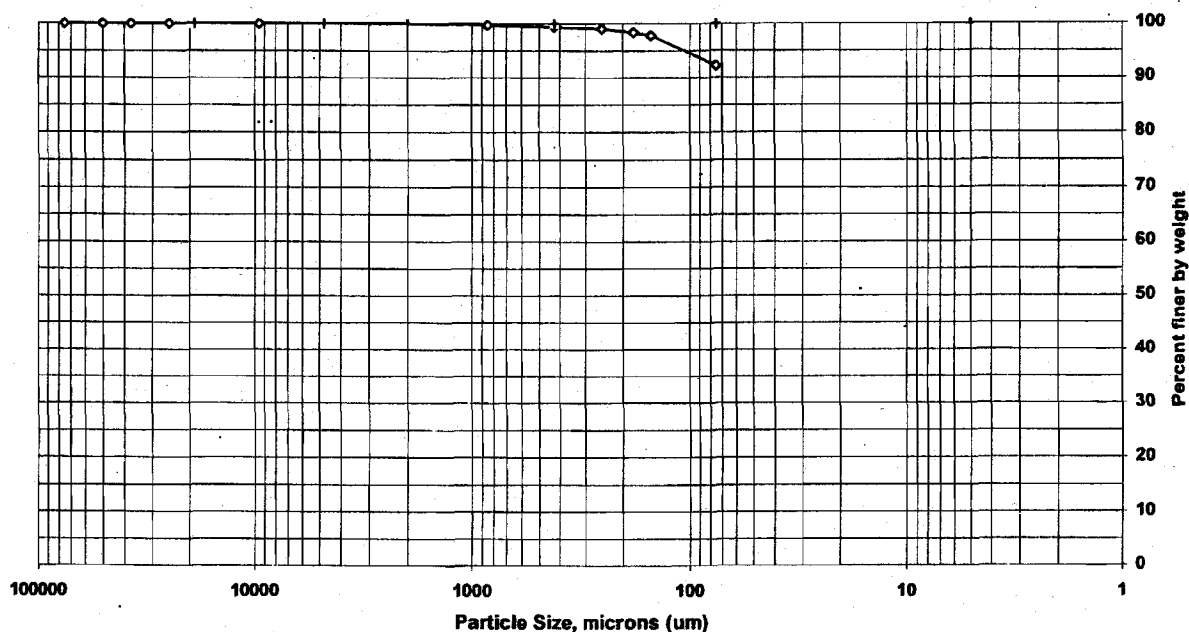
Client Code: STLCOD  
 Sample ID: CHPK0004D00105  
 Lab ID: 654696

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 77.5%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Med sand

Non-soil material: n/a  
 Shape (> #10): n/a  
 Hardness (> #10): n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.7	0.3
#40	425	99.4	0.3
#60	250	99.1	0.3
#80	180	98.4	0.7
#100	150	97.8	0.6
#200	75	92.3	5.6
Hydrometer	0.0	0.0	92.3
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	7.7
Coarse Sand	0.0
Medium Sand	0.6
Fine Sand	7.1
Silt	92.3
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

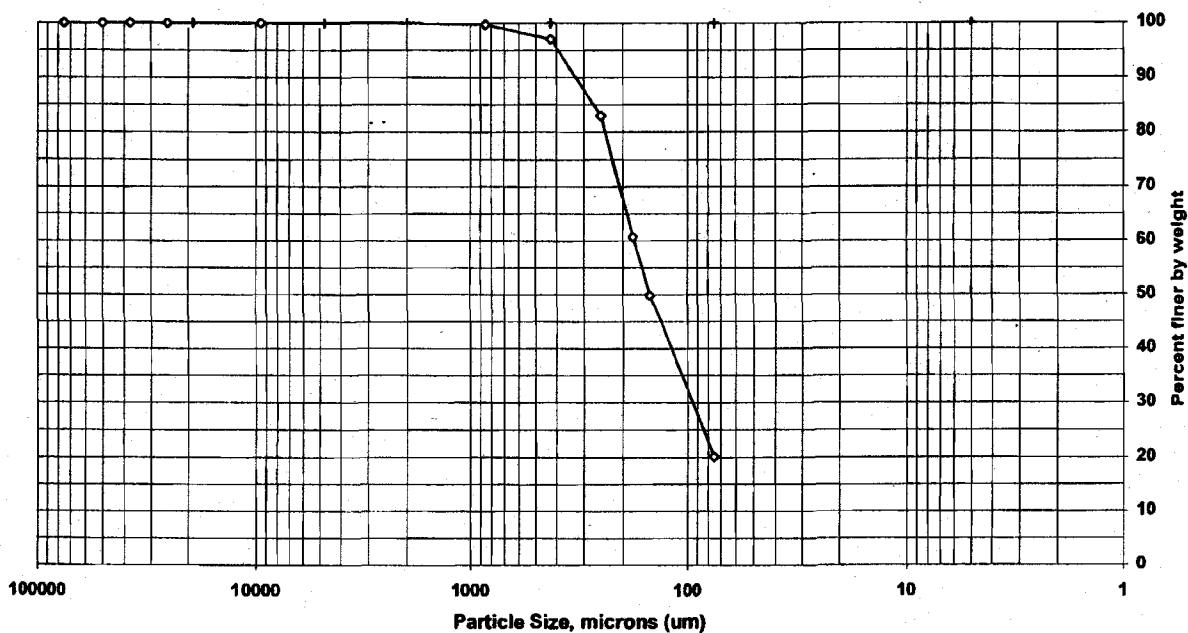
Client Code: STLCOD  
 Sample ID: CHPK0004E00105  
 Lab ID: 654697

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 82.5%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Med sand

Non-soil material: n/a  
 Shape (> #10): n/a  
 Hardness (> #10): n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.7	0.3
#40	425	97.0	2.7
#60	250	83.0	14.0
#80	180	60.7	22.3
#100	150	49.8	10.9
#200	75	20.1	29.8
Hydrometer	0.0	0.0	20.1
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	79.9
Coarse Sand	0.0
Medium Sand	3.0
Fine Sand	76.9
Silt	20.1
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

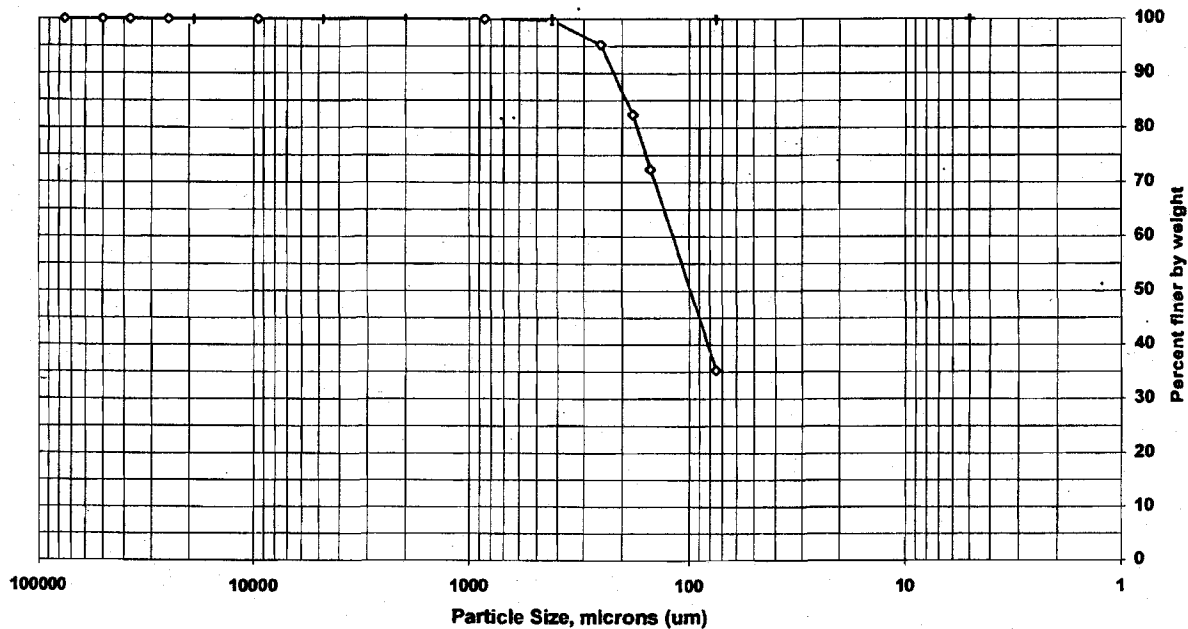
Client Code: STLCOD  
 Sample ID: CHPK0004F00105  
 Lab ID: 654698

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 82.9%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Med sand

Non-soil material: n/a  
 Shape (> #10): n/a  
 Hardness (> #10): n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	100.0	0.0
#40	425	99.7	0.2
#60	250	95.3	4.5
#80	180	82.4	12.9
#100	150	72.4	10.0
#200	75	35.3	37.1
Hydrometer	0.0	0.0	35.3
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	64.7
Coarse Sand	0.0
Medium Sand	0.3
Fine Sand	64.4
Silt	35.3
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

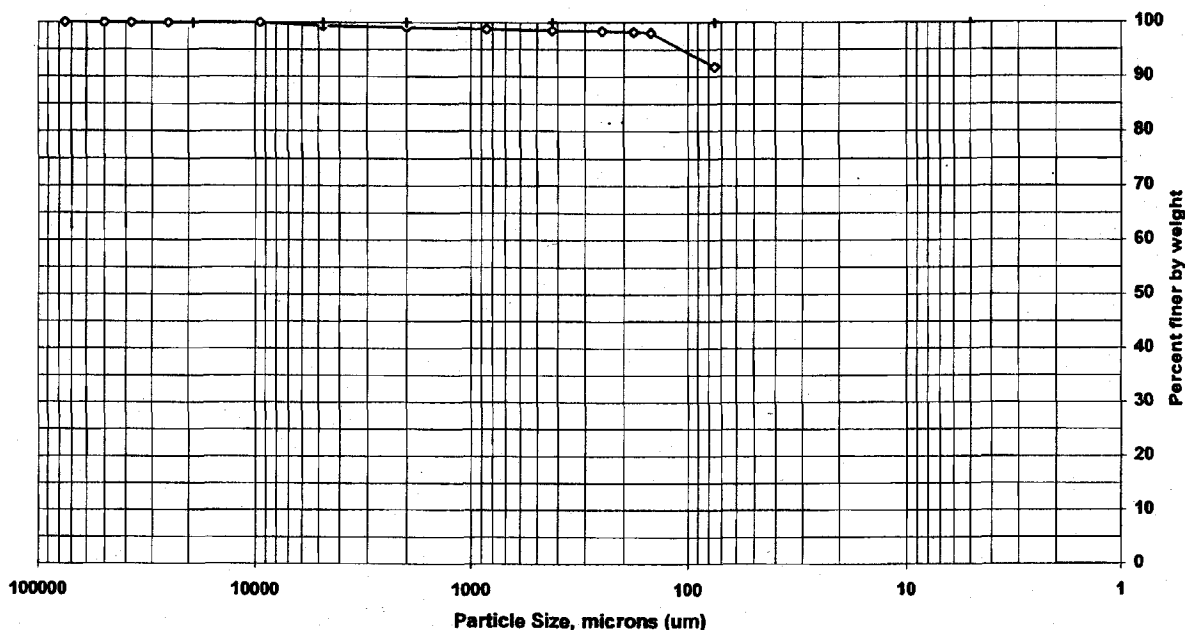
Client Code: STLCOD  
 Sample ID: CHPK0004G00105  
 Lab ID: 654699

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 94.9%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 9.5 mm

Non-soil material: n/a  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	99.4	0.6
#10	2000	99.1	0.3
#20	850	98.8	0.3
#40	425	98.5	0.2
#60	250	98.5	0.1
#80	180	98.3	0.2
#100	150	98.1	0.2
#200	75	91.8	6.3
Hydrometer	0.0	0.0	91.8
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.6
Sand	7.5
Coarse Sand	0.3
Medium Sand	0.5
Fine Sand	6.7
Silt	91.8
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

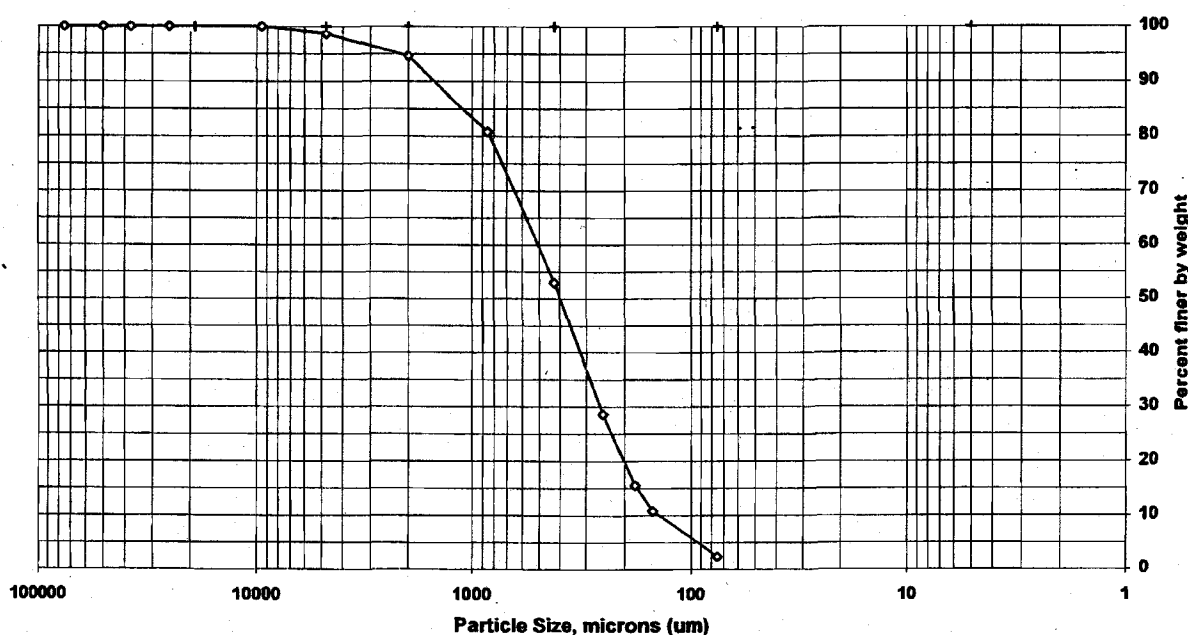
Client Code: STLCOD  
 Sample ID: CHPK0004H00105  
 Lab ID: 654700

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 78.5%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 9.5 mm

Non-soil material: n/a  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	98.6	1.4
#10	2000	94.6	4.0
#20	850	80.8	13.8
#40	425	53.0	27.8
#60	250	28.6	24.4
#80	180	15.6	13.0
#100	150	10.8	4.7
#200	75	2.4	8.4
Hydrometer	0.0	0.0	2.4
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	1.4
Sand	96.2
Coarse Sand	4.0
Medium Sand	41.6
Fine Sand	50.6
Silt	2.4
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

# Particle Size of Soils by ASTM D422\_MOD

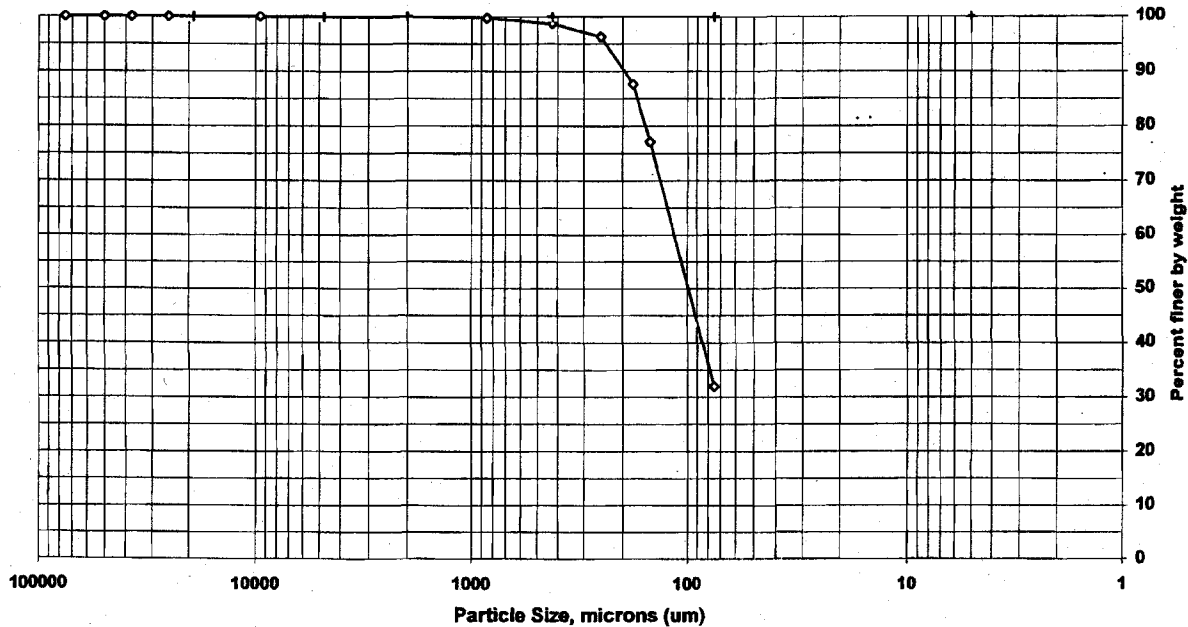
Client Code: STLCOD  
 Sample ID: CHPK0004I00105  
 Lab ID: 6547D1

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 83.2%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: Crs sand

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	99.7	0.2
#40	425	98.7	1.0
#60	250	96.3	2.4
#80	180	87.6	8.7
#100	150	77.1	10.5
#200	75	32.0	45.1
Hydrometer	0.0	0.0	32.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	68.0
Coarse Sand	0.0
Medium Sand	1.2
Fine Sand	66.7
Silt	32.0
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

# Particle Size of Soils by ASTM D422\_MOD

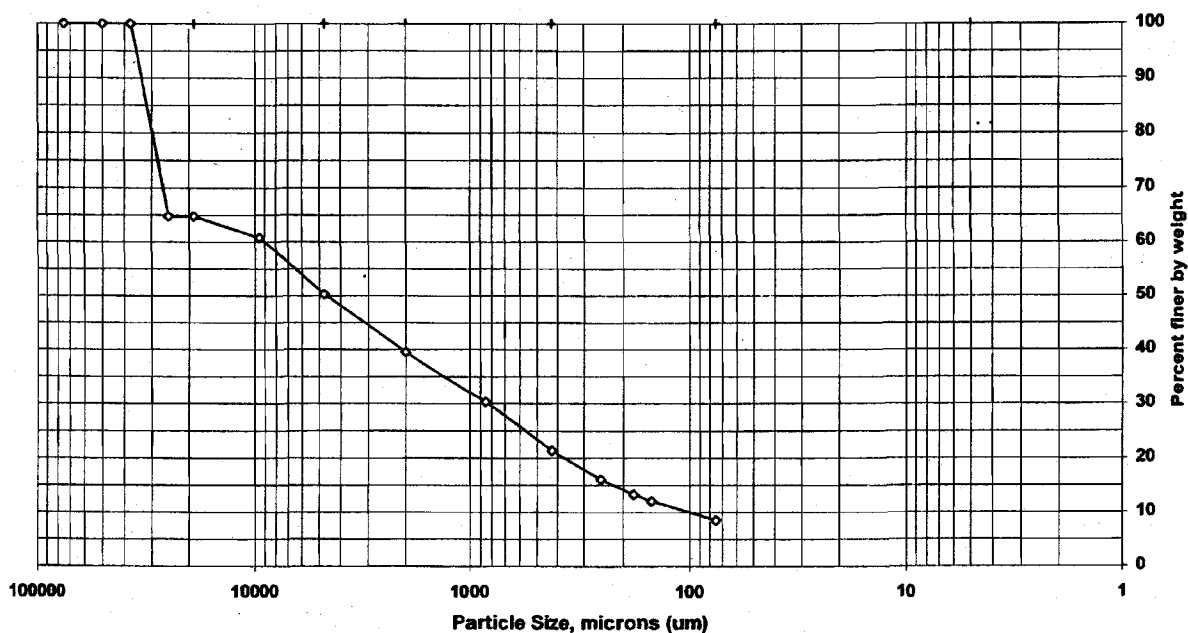
Client Code: STLCOD  
 Sample ID: CHPK0004J00105  
 Lab ID: 654702

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 93.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 37.5 mm

Non-soil material: n/a  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	64.7	35.3
3/4 inch	19000	64.7	0.0
3/8 inch	9500	60.8	3.9
#4	4750	50.3	10.6
#10	2000	39.5	10.7
#20	850	30.3	9.2
#40	425	21.4	8.9
#60	250	16.0	5.4
#80	180	13.3	2.7
#100	150	12.0	1.3
#200	75	8.5	3.5
Hydrometer	0.0	0.0	8.5
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	49.7
Sand	41.7
Coarse Sand	10.7
Medium Sand	18.1
Fine Sand	12.9
Silt	8.5
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute



## Particle Size of Soils by ASTM D422\_MOD

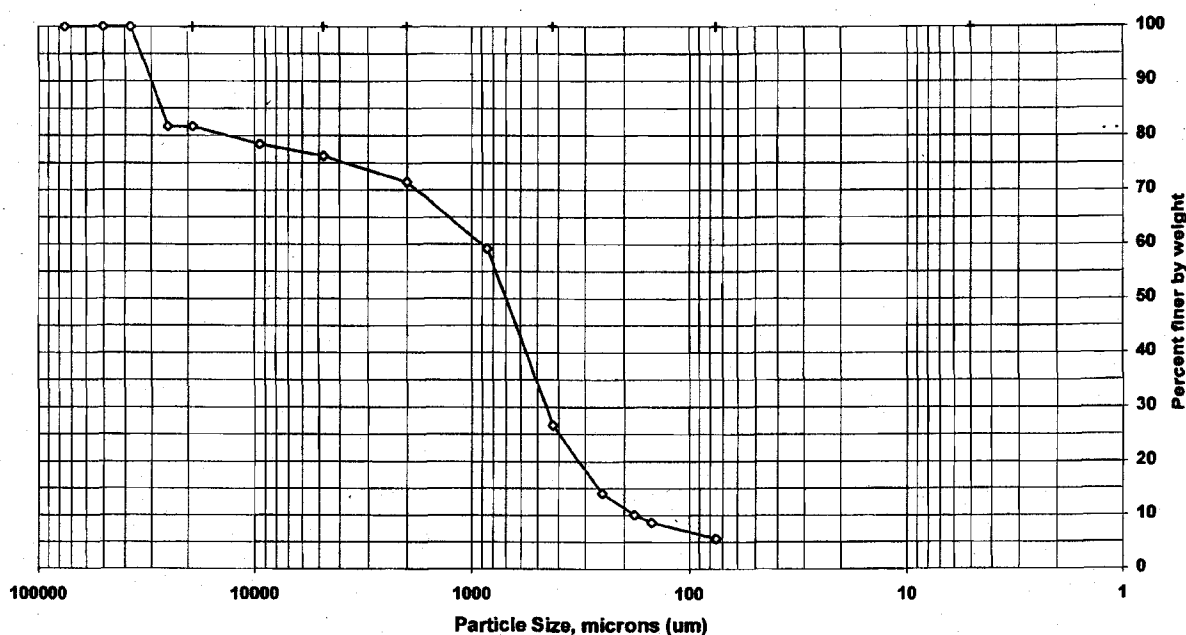
Client Code: STLCOD  
 Sample ID: CHPK0004K00105  
 Lab ID: 654703

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 87.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 37.5 mm

Non-soil material: n/a  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	81.7	18.3
3/4 inch	19000	81.7	0.0
3/8 inch	9500	78.4	3.3
#4	4750	76.2	2.2
#10	2000	71.5	4.8
#20	850	59.2	12.3
#40	425	26.7	32.5
#60	250	14.0	12.6
#80	180	10.0	4.0
#100	150	8.6	1.5
#200	75	5.6	3.0
Hydrometer	0.0	0.0	5.6
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	23.8
Sand	70.6
Coarse Sand	4.8
Medium Sand	44.8
Fine Sand	21.0
Silt	5.6
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

# Particle Size of Soils by ASTM D422\_MOD

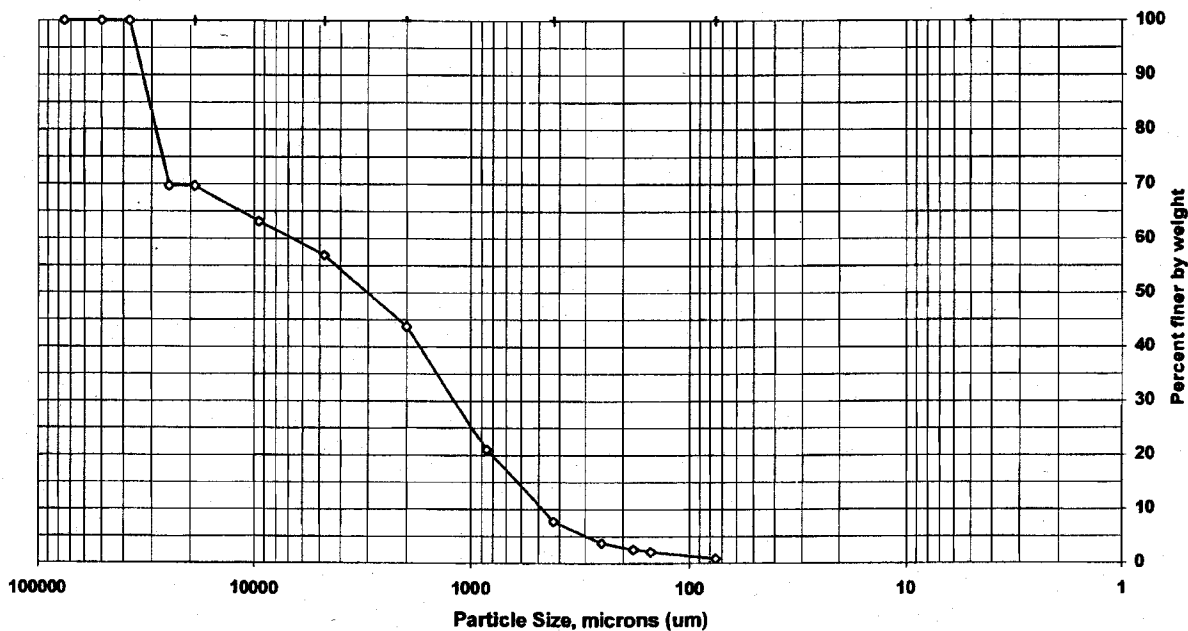
Client Code: STLCOD  
 Sample ID: CHPK0004L00105  
 Lab ID: 654704

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 89.1%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 37.5 mm

Non-soil material: n/a  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	69.7	30.3
3/4 inch	19000	69.7	0.0
3/8 inch	9500	63.2	6.5
#4	4750	56.9	6.2
#10	2000	43.7	13.2
#20	850	21.0	22.7
#40	425	7.7	13.3
#60	250	3.7	4.0
#80	180	2.5	1.2
#100	150	2.1	0.4
#200	75	0.8	1.2
Hydrometer	0.0	0.0	0.8
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	43.1
Sand	56.1
Coarse Sand	13.2
Medium Sand	36.0
Fine Sand	6.9
Silt	0.8
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

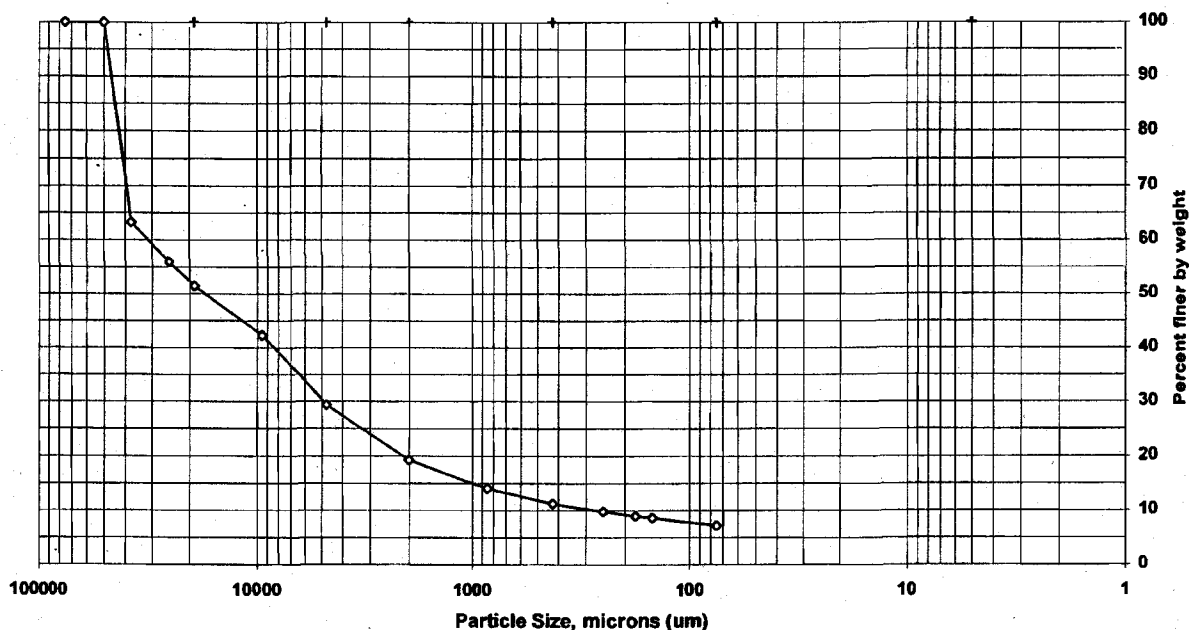
Client Code: STLCOD  
 Sample ID: CHPK0004M00105  
 Lab ID: 654705

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 95.6%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 50 mm

Non-soil material: n/a  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	63.2	36.8
1 inch	25000	55.9	7.3
3/4 inch	19000	51.5	4.5
3/8 inch	9500	42.3	9.1
#4	4750	29.4	13.0
#10	2000	19.2	10.1
#20	850	14.0	5.2
#40	425	11.2	2.8
#60	250	9.7	1.5
#80	180	8.9	0.8
#100	150	8.6	0.3
#200	75	7.2	1.4
Hydrometer	0.0	0.0	7.2
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	70.6
Sand	22.2
Coarse Sand	10.1
Medium Sand	8.0
Fine Sand	4.0
Silt	7.2
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

## Particle Size of Soils by ASTM D422\_MOD

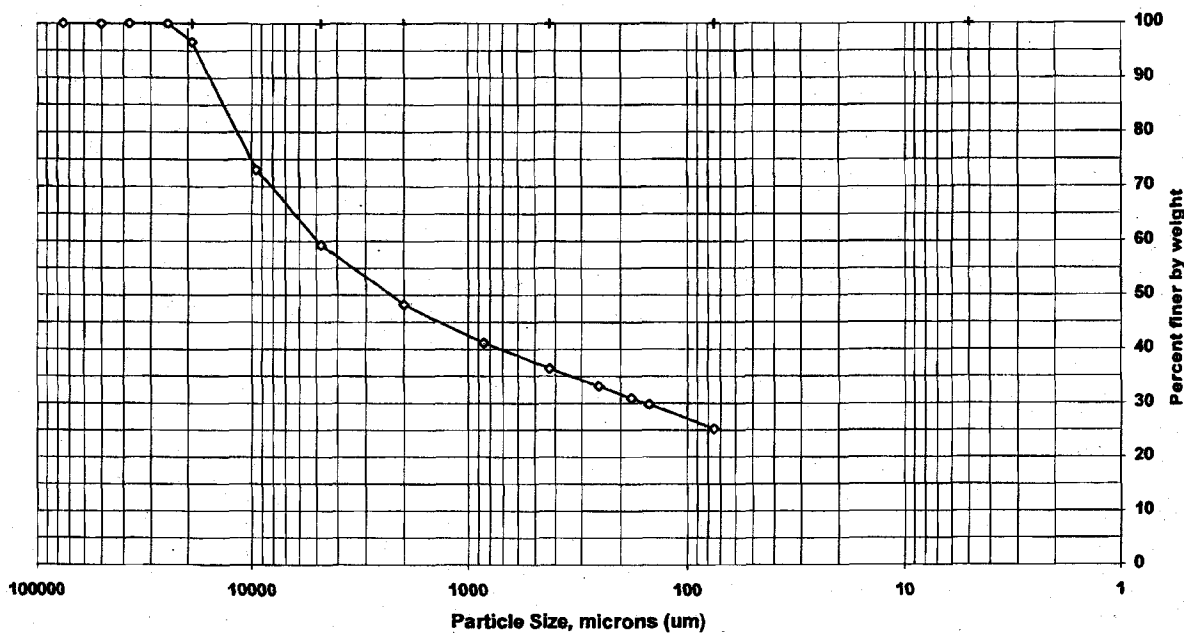
Client Code: STLCOD  
 Sample ID: CHPK0004N00105  
 Lab ID: 654706

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 96.1%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 25 mm

Non-soil material: n/a  
 Shape (> #10): subrounded  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	96.6	3.4
3/8 inch	9500	73.0	23.6
#4	4750	59.3	13.7
#10	2000	48.2	11.1
#20	850	41.2	7.0
#40	425	36.4	4.8
#60	250	33.2	3.2
#80	180	31.0	2.2
#100	150	29.8	1.2
#200	75	25.3	4.5
Hydrometer	0.0	0.0	25.3
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
I	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	40.7
Sand	34.0
Coarse Sand	11.1
Medium Sand	11.8
Fine Sand	11.2
Silt	25.3
Clay	0.0

Preparation Method: D2217  
 Dispersion Device: Mechanical mixer with a metal paddle.  
 Dispersion Period: 1 minute

# Particle Size of Soils by ASTM D422\_MOD

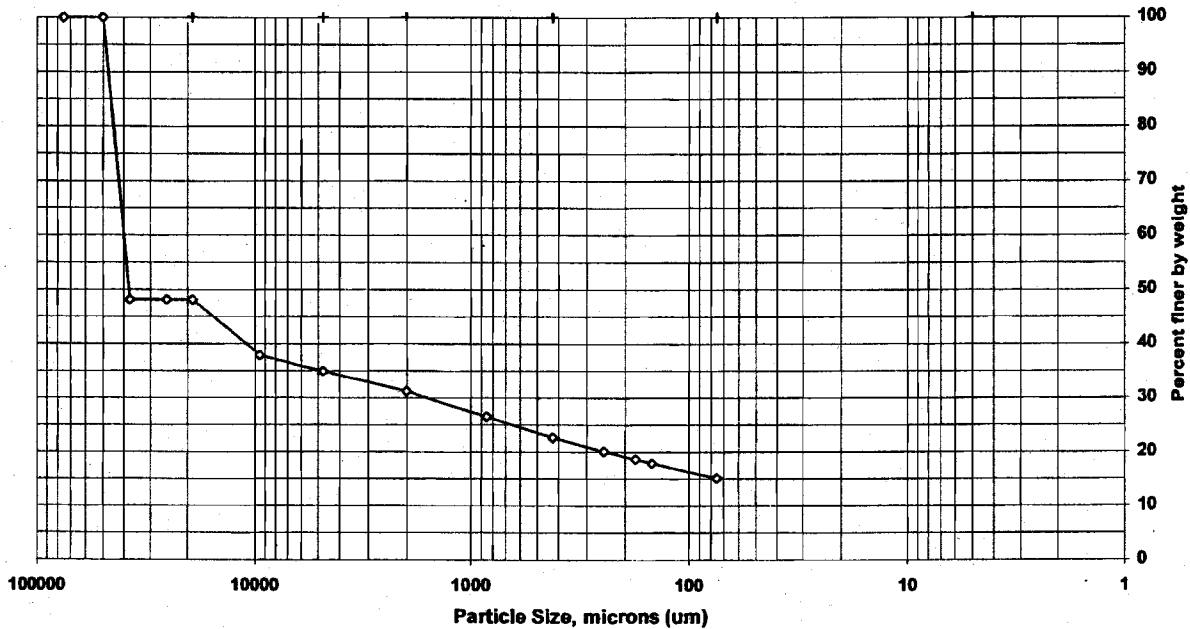
Client Code: STLCOD  
 Sample ID: CHPK0004O00105  
 Lab ID: 654707

SDG: 6A160207  
 ETR(s): 112132

Date Received: 1/18/2006  
 Start Date: 1/19/2006  
 End Date: 2/3/2006

Percent Solids: 88.7%  
 Specific Gravity: 2.650 (assumed)  
 Maximum Particle Size: 50 mm

Non-soil material: n/a  
 Shape (> #10): subangular  
 Hardness (> #10): hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	48.1	51.9
1 inch	25000	48.1	0.0
3/4 inch	19000	48.1	0.0
3/8 inch	9500	37.9	10.2
#4	4750	34.9	3.0
#10	2000	31.3	3.6
#20	850	26.5	4.8
#40	425	22.6	3.8
#60	250	20.1	2.5
#80	180	18.6	1.5
#100	150	17.8	0.7
#200	75	15.1	2.7
Hydrometer	0.0	0.0	15.1
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent of Total Sample
Gravel	65.1
Sand	19.8
Coarse Sand	3.6
Medium Sand	8.6
Fine Sand	7.5
Silt	15.1
Clay	0.0

Preparation Method: **D2217**  
 Dispersion Device: Mechanical mixer with  
 a metal paddle.  
 Dispersion Period: 1 minute

14.3°  
Ed  
noise

# Chain of Custody Record

COC Number: CH006531

CH2MHILL

Page 1 of 4

Project Name MMR Location MMR  
Task Order 251 Project 2005/10 FS-28 Drilling  
Project Number 324146.05.90.07  
Project Manager R Citterman  
Sample Manager Drew Tingley (508) 968-4670  
Turnaround Time 21 Days  
PO Number RC

Sample ID Sample Date/Time Type Matrix # Containers Preserv

CHPK0004A00105 10/05/05 0910 N Soil

Sieve only Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK0004B00105 10/05/05 1202 N Soil

Sieve only Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK0004C00105 10/05/05 1202 N Soil

Sieve only Field Filtered ☐ 1 4°C

Total Containers: 1

CHPK0004D00105 10/06/05 0949 N Soil

Sieve only Field Filtered ☐ 1 4°C

Total Containers: 1

ASTM D-422

MS = Matrix Spike SD = Matrix Spike Duplicate

	Signatures	Date/Time
Approved by	<i>K. Citterman</i>	1-12-06
Sampled by	<i>M. Green</i>	1-12-06
Relinquished by	<i>M. Green</i>	1-12/06 1600
Received by	<i>[Signature]</i>	1/16/06 0830
Relinquished by		
Received by		

Shipping Details  
Method of Shipment: FedEx  
On Ice: yes / no  
Airbill No: 792629837760  
Lab Name: Severn Trent - Denver  
Lab Phone: (303) 736-0100

ATTN:  
Sample Custody  
and  
Wayne Scott

Special Instructions:  
Report Copy to  
Vito D'Aurora  
(530) 229-3365

STL Denver

COC Number: **CH006531**

Page 2 of 4

ASTM D-422

**Total Containers:** 1

Vito D'Aurora  
(530) 229-3365

COC Number: CH006531

**CH2MHILL**

Page 4 of 4

[illegible]

**MS = Matrix Spike    SD = Matrix Spike Duplicate**

Signatures		Date/Time	Shipping Details		ATTN:	Special Instructions:
Approved by	<i>K. Gattol</i>	<i>1-12-06</i>	Method of Shipment:	FedEx		
Sampled by	<i>M. Green</i>	<i>1-12-06</i>	On Ice: yes / no		Sample Custody	Report Copy to
Relinquished by	<i>AM. J...</i>	<i>1-12-06/1600</i>	Airbill No:	<i>7926 298 37760</i>	and	Vito D'Aurora
Received by	<i>[Signature]</i>	<i>1/16/06 0830</i>	Lab Name:	Severn Trent - Denver	Wayne Scott	(530) 229-3365
Relinquished by			Lab Phone:	(303) 736-0100		
Received by						



## Chain of Custody Record

COC Number: CH006531

CH2MHILL

Page 3 of 4

Project Name MMR Location MMR  
 Task Order 251 Project 2005/10 FS-28 Drilling  
 Project Number 324146.05.90.07  
 Project Manager R Citterman  
 Sample Manager Drew Tingley (508) 968-4670  
 Turnaround Time 21 Days  
 PO Number RC

Sample ID Sample Date/Time Type Matrix # Containers Preserv

CHPK0004I00105 10/06/05 1559 N Soil

Sieve only

Field Filtered ☐ 1 4°C

ASTM D-422

206.8-210.9'

Total Containers: 1

CHPK0004J00105 10/07/05 1105 N Soil

Sieve only

Field Filtered ☐ 1 4°C

215-225.5', 240-247.5'

Total Containers: 1

CHPK0004K00105 10/07/05 1105 N Soil

Sieve only

Field Filtered ☐ 1 4°C

225.5-232.2'

Total Containers: 1

CHPK0004L00105 10/07/05 1414 N Soil

Sieve only

Field Filtered ☐ 1 4°C

235-240'

Total Containers: 1

MS = Matrix Spike SD = Matrix Spike Duplicate

	Signatures	Date/Time
Approved by	<i>K. Catter</i>	1-12-06
Sampled by	<i>M. Green</i>	1-12-06
Relinquished by	<i>M. Green</i>	1-12-06/1600
Received by	<i>John</i>	1/16/06 0830
Relinquished by		
Received by		

## Shipping Details

Method of Shipment: FedEx

On Ice: yes / no

Airbill No: 7926 29837760

Lab Name: Severn Trent - Denver

Lab Phone: (303) 736-0100

ATTN:

Sample Custody

and

Wayne Scott

Special Instructions:

Report Copy to

Vito D'Aurora

(530) 229-3365

STL Denver

Project Name: FS-28 SPEIM				Location: Western edge of East Thompson Bog			
Project Number: 324146		Northing: 221057.03		Easting: 853558.29		Ground Surface Elevation: 25.14	
Drilling Contractor: Boart Longyear Co.			Date Started: 10/13/2005			Date Finished: 10/13/2005	
Drilling Equipment: #1509 GP24-300RS			Total Depth Drilled ft (BGS): 75				
Drilling Method: Sonication			Borehole Diameter (in.): 5.5				
Sampling Method: Core Barrel			Logged By: M. Greenberg			Reviewed By: CH2M HILL	
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	
0			Soil logging starts at 3 feet. No monitoring well was installed upon completion of drilling. Native collapse filled borehole.  0-55ft.: Driller reported very loose drilling conditions. No tight drilling zones encountered. Soils are very loose, very saturated, and heaving into casing.				
			CHPK00200A00105	1.8/0.0	SP	SAND, 2.5Y 6/4 light yellowish brown, medium grained, little fine sand, trace to little coarse sand, trace silt, trace fine to coarse subrounded gravel, wet.	
5			CHPK00200B00105		SP	SAND, 10YR 6/6 brownish yellow, medium grained, little fine sand, trace to little coarse sand, trace silt, trace subrounded fine to coarse gravel, saturated.	
			CHPK00200C00105		SP	SAND, 2.5Y 6/3 light yellowish brown, medium grained, trace to little coarse sand, little fine sand, trace silt, trace subrounded to subangular fine gravel, saturated.	
10			CHPK00200D00105	0.5/2.1	SP	SAND, 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace subrounded fine gravel, trace silt, saturated.	
					NSNR	No recovery.	
15			CHPK00200E00105		SP	SAND, 2.5Y 6/3 light yellowish brown, medium grained, little coarse sand, trace to little fine sand, trace to little subrounded fine to coarse gravel, trace silt, saturated.	
			CHPK00200F00105		SP	SAND, 5Y 6/2 light olive gray, fine to medium grained, trace coarse sand, trace silt, trace fine to coarse gravel, saturated.	
20							
25							



Project Name: FS-28 SPEIM					Location: Western edge of East Thompson Bog	
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol
					NSNR	No recovery.
30						
35			CHPK00200G00105	0.0/0.0	SP	SAND, 2.5Y 6/3 light yellowish brown, medium grained, trace coarse sand, little fine sand, trace to little subrounded coarse gravel, trace silt, trace subrounded fine to coarse gravel, trace rounded cobble.
40			CHPK00200H00105		SP	SAND, 2.5Y 6/2 light brownish gray, fine to medium grained, trace coarse sand, trace silt, trace subrounded to rounded fine to coarse gravel, saturated.
45					NSNR	No recovery.
50						
55			CHPK00200I00105	0.0/0.0	SP	SAND, 2.5Y 6/2 light brownish gray, fine to medium grained, trace coarse sand, trace silt, trace rounded fine gravel, saturated.



LOCATION: 69BH2000

FS-28 SPEIM

Project Name: FS-28 SPEIM						Location: Western edge of East Thompson Bog	
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	
60			CHPK00200J00105  CHPK00200K00105				
65					SPSM		SAND, 2.5Y 6/2 light brownish gray, fine grained, little medium sand, trace to little silt, trace coarse sand.
70					SM		SAND and SILT, 5Y 5/1 gray, fine grained, trace medium sand, saturated.
75					NSNR		No recovery. Bottom of boring at 75 feet.
							Notes: 1. No Well Installed Printed on 4/19/2006

**FS-28 Borehole Groundwater Screening Results**  
**Soil Boring Location 69BH2001**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L
A	30	35	32.5	-4.5	ND
B	40	45	42.5	-14.5	BRL
C	50	55	52.5	-24.5	ND
D	60	65	62.5	-34.5	ND
E	70	75	72.5	-44.5	ND
F	80	85	82.5	-54.5	ND
G	90	95	92.5	-64.5	ND
H	100	105	102.5	-74.5	ND
I	110	115	112.5	-84.5	ND
J	120	125	122.5	-94.5	ND
K	130	135	132.5	-104.5	ND
L	140	145	142.5	-114.5	ND
M	150	155	152.5	-124.5	ND
N	160	165	162.5	-134.5	ND
O	170	175	172.5	-144.5	ND
P	180	185	182.5	-154.5	ND
Q	190	195	192.5	-164.5	ND
R	200	205	202.5	-174.5	ND
S	210	215	212.5	-184.5	ND
T	220	225	222.5	-194.5	ND
U	230	235	232.5	-204.5	ND
V	240	245	242.5	-214.5	ND

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 28 ft msl

Bold indicates concentrations exceed the MMCL

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

BRL = below reporting limit

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

ND = not detected

TOS = top of sample

µg/L = micrograms per liter





Project Name: FS-28 SPEIM				Location: Front - 86 Turner Road			
Project Number: 324146		Northing: 220905.76		Easting: 853433.21		Ground Surface Elevation: 29.96	
Drilling Contractor: Boart Longyear Co.			Date Started: 1/5/2006			Date Finished: 1/12/2006	
Drilling Equipment: #1512 GP24-300RS			Total Depth Drilled ft (BGS): 253				
Drilling Method: Sonication			Borehole Diameter (in.): 5.5				
Sampling Method: Core Barrel/Sub Pump			Logged By: M. Greenberg			Reviewed By: CH2M HILL	
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	
0			Soil logging starts at 5 feet. No monitoring well was installed upon completion of drilling.				
5					ML	SILT, 2.5Y 5/2 grayish brown, little fine to medium sand, trace coarse sand, trace subangular fine to coarse gravel, wet.	
					PT	PEAT, 2.5Y 2.5/1 black, moist.	
10					SM	SAND, 2.5Y 4/2 dark grayish brown, medium grained, little silt, little coarse sand, little subangular fine to coarse gravel, trace organics, wet.	
					SM	SAND, 2.5Y 6/3 light yellowish brown, some coarse sand, little silt, little fine sand, trace subangular to subrounded fine to coarse gravel, wet.	
15			Water table encountered at 17 feet.	0.8/0.6	SP	SAND, 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, trace rounded fine to coarse gravel, wet.	
20			CHPK00201AO0106		SP	SAND, 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace fine gravel, trace silt, wet.	
25				2.6/3.5	SP	SAND, 2.5Y 6/2 light brownish gray, fine to medium grained, trace coarse sand, trace silt, trace subrounded fine to coarse gravel, wet.	
30							
35			CHPK00201BO0106	2.0/1.4	NSNR	No recovery.	
					SP	SAND, 2.5Y 7/3 pale yellow, medium grained, little fine sand, trace coarse sand, trace silt, trace subrounded fine to coarse gravel, saturated.	

Project Name: FS-28 SPEIM				Location: Front - 86 Turner Road		
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol
40						
					SP	SAND, 2.5Y 6/4 light yellowish brown, fine grained, some medium sand, trace coarse sand, trace silt, saturated.
45					NSNR	No recovery.
50						
55			55-75 ft.: While extracting sample from core barrel top portion accidentally fell out. 55-65 ft bgs.: Driller reports very easy drilling conditions.		NSNR	No recovery.
60						
65			65-75 ft.: Conditions become progressively harder.			
70			CHPK00201CO0106	0.0/0.0	SP SM	SAND, 5Y gray, fine grained, little medium sand, trace coarse sand, trace silt, wet. SAND, 5Y 5/1 gray, fine grained, little silt, saturated.
75			CHPK00201DO0106	0.0/0.0	SP ML	SAND, 5Y 6/1 gray, fine grained, little medium sand, trace coarse sand, trace silt, wet. SILT, 5Y 4/1 dark gray, little very fine sand, saturated.
80						
			CHPK00201EO0106	0.0/3.1	SPSM	SAND, 5Y 5/1 gray, fine grained, trace to little silt, trace medium sand,

**LOCATION: 69BH2001**

Project Name: FS-28 SPEIM				Location: Front - 86 Turner Road		
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol
85						wet.
90						
95			CHPK00201FO0106		NSNR	No recovery.
					SM	SILT and SAND, 5Y 5/1 gray, fine grained, trace clay, saturated.
100					SP	SAND, 2.5Y 5/3 light olive brown, fine grained, trace to little medium sand, trace coarse sand, trace silt, saturated.
					SCSM	SAND, 5Y 5/1 gray, fine grained, little silt, little clay, saturated, medium sand lenses through interval.
105			CHPK00201GO0106		SM	SAND, 2.5Y 5/3 olive brown, fine grained, trace to little medium sand, trace coarse sand, little silt, saturated.
110					SM	SILT and SAND, 5Y 5/1 gray, fine grained, trace clay, saturated.
					NSNR	No recovery.
115			CHPK00201HO0106 115-135 ft.: Coring was fairly smooth, according to driller.		SP	SAND, 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, saturated.
120				0.0/0.8		
125						





Project Name: FS-28 SPEIM				Location: Front - 86 Turner Road		
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol
130			CHPK00201IO0106 135-155 ft.: Coring was fairly smooth, according to driller.	0.0		
135					NSNR	No recovery.
140				5.9/7.3	SPSM	SAND, 2.5Y 5/4 light olive brown, fine grained, some medium sand, trace to little coarse sand, trace to little silt, trace rounded fine to coarse gravel, saturated.
145				2.3		
150						
155					NSNR	No recovery.
160			CHPK00201JO0106		SPSM	SAND, 2.5Y 5/4 light olive brown, fine grained, some medium sand, trace to little coarse sand, trace to little silt, trace rounded fine to coarse gravel, saturated.
165						
170					SP	SAND, 2.5Y 5/4 light olive brown, fine grained, trace to little medium sand, trace coarse sand, trace silt, saturated.

Project Name: FS-28 SPEIM				Location: Front - 86 Turner Road		
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol
175			CHPK00201KO0106	0.8/0.9	NSNR	No recovery.
180			CHPK00201LO0106	2.8	SP	SAND, 2.5Y 5/4 light olive brown, fine to medium grained, trace to little coarse sand, trace silt, trace rounded fine to coarse gravel, saturated.
185					SP	SAND, 2.5Y 6/4 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, trace rounded fine to coarse gravel, saturated.
190					SP	
195			CHPK00201MO0106		SP	SAND, 2.5Y 6/3 light yellowish brown, fine grained, some medium sand, trace coarse sand, trace silt, trace rounded fine to coarse gravel, saturated.
200						
205						
210						
215			215-235 ft.: Core barrel advanced very easily.		NSNR	No recovery.
					SP	SAND, 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, trace rounded fine to coarse gravel, saturated.



Project Name: FS-28 SPEIM					Location: Front - 86 Turner Road	
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol
220				0.0/0.0		
225						
230				2.8/0.2		
					NSNR	No recovery.
235					NSNR	No recovery.
240						
245						
250			Core barrel encountered refusal at 249 feet. Driller believes bedrock maybe present at 249 feet.  249-253 ft.: Core barrel advanced as in rock. Core barrel jumped a lot as it moved. Driller believes rock was encountered.		NACM	ROCK, dark fine grained granite piece, cobble size, surrounded by fine to medium sand, saturated.
					NACM	ROCK, fine grained granite, ranges in size from coarse gravel to 0.3-foot pieces.
					NSNR	No recovery.
255						Notes: 1. No Well Installed



LOCATION: 69BH2001

3  
2  
2  
1  
1  
-  
-10  
-15  
-20  
-25  
-30  
-35  
-40





LOCATION: 69BH2001

[illegible]



**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0101**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
5/26/2004	A	1.9	11	6.5	21.6	ND	dark yellow brown, fine sand
5/26/2004	B	11	21	16	12	ND	brownish yellow, fine sand and silt
5/26/2004	C	21	31	26	2	ND	light yellow-brown, fine sand and silt
5/26/2004	D	31	41	36	-8	ND	pale yellow, fine sand and silt
5/26/2004	E	41	51	46	-18	<b>0.41</b>	pale yellow, little fine sand
5/26/2004	F	51	61	56	-28	<b>2.14</b>	pale yellow, little fine sand
5/26/2004	G	61	71	66	-38	<b>2.08</b>	pale yellow, little fine sand
5/26/2004	H	71	81	76	-48	<b>2.00</b>	pale yellow, little fine sand
5/27/2004	I	81	91	86	-58	<b>0.609</b>	light grey, trace fine sand
5/27/2004	J	91	101	96	-68	<b>0.044</b>	light grey, trace fine sand
5/27/2004	K	101	111	106	-78	BRL	light grey, trace fine sand
5/27/2004	L	111	121	116	-88	BRL	light grey, trace fine sand
5/27/2004	M	121	131	126	-98	BRL	clear
5/27/2004	N	131	141	136	-108	<b>0.047</b>	clear
5/28/2004	O	141	151	146	-118	BRL	clear
6/1/2004	P	151	161	156	-128	BRL	clear
6/1/2004	Q	161	171	166	-138	BRL	light grey, trace fine sand
6/1/2004	R	171	181	176	-148	BRL	light grey, no sand or silt
6/1/2004	S	181	191	186	-158	BRL	medium grey, trace fine sand and silt
6/2/2004	T	191	201	196	-168	BRL	light grey, trace fine sand
6/2/2004	U	201	211	206	-178	<b>0.049</b>	light grey, trace fine sand
6/2/2004	V	211	221	216	-188	ND	medium grey, trace fine sand and silt
6/2/2004	W	221	231	226	-198	BRL	dark grey, fine sand and silt
6/4/2004	X	231	241	236	-208	ND	dark grey, fine sand and silt

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 28 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

**Key:**

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0102**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
6/10/2004	A	3	13	8.0	19.5	ND	dark grey lots of sand and silt
6/10/2004	B	13	23	18.0	9.5	ND	golden brown some silt
6/10/2004	C	23	33	28.0	-0.5	ND	golden brown some silt
6/10/2004	D	33	43	38.0	-10.5	ND	tan with fine sand and silt
6/10/2004	E	43	53	48.0	-20.5	ND	dark grey/brown trace fine sand
6/10/2004	F	53	63	58.0	-30.5	ND	light grey/very trace fine sand
6/10/2004	G	63	73	68.0	-40.5	ND	yellow/grey/with fine sand trace silt
6/10/2004	H	73	83	78.0	-50.5	ND	light grey, cloudy, trace silt
6/10/2004	I	83	93	88.0	-60.5	ND	light grey, cloudy, trace silt
6/11/2004	J	93	103	98.0	-70.5	ND	light yellow grey with trace fine sand
6/11/2004	K	103	113	108.0	-80.5	ND	medium grey with fine sand and silt
6/11/2004	L	113	123	118.0	-90.5	<b>0.037</b>	grey with fine sand and silt
6/11/2004	M	123	133	128.0	-100.5	<b>4.05</b>	dark grey with fine sand (purge dry 2X)
6/11/2004	N	133	143	138.0	-110.5	<b>3.38</b>	medium grey with fine sand
6/11/2004	O	143	153	148.0	-120.5	<b>3.14</b>	dark grey with fine sand (purge dry)
6/15/2004	P	153	163	158.0	-130.5	<b>1.14</b>	light grey/little silt
6/15/2004	Q	163	173	168.0	-140.5	<b>0.146</b>	dark grey/fine sand
6/15/2004	R	173	183	178.0	-150.5	<b>0.036</b>	light grey/little silt
6/15/2004	S	183	193	188.0	-160.5	<b>0.033</b>	yellow/grey/no silt
6/15/2004	T	193	203	198.0	-170.5	ND	yellow/grey/no silt

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 27.5 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

ND = not detected

EDB = ethylene dibromide

TOS = top of sample

ft bgs = feet below ground surface

µg/L = micrograms per liter

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level



**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0103**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
6/16/2004	A	3	13	8.0	16.0	ND	dark red/brown, some silt
6/16/2004	B	13	23	18.0	6.0	ND	light grey, cloudy
6/16/2004	C	23	33	28.0	-4.0	ND	light grey, cloudy
6/16/2004	D	33	43	38.0	-14.0	ND	light grey, cloudy
6/16/2004	E	43	53	48.0	-24.0	ND	medium grey with fine sand
6/16/2004	F	53	63	58.0	-34.0	BRL	medium grey, very trace fine sand
6/16/2004	G	63	73	68.0	-44.0	<b>0.054</b>	light grey, trace fine sand
6/16/2004	H	73	83	78.0	-54.0	<b>0.089</b>	light grey, trace fine sand
6/17/2004	I	83	93	88.0	-64.0	ND	light grey, trace fine sand
6/17/2004	J	93	103	98.0	-74.0	ND	dark grey, lots of sand and silt
6/17/2004	K	103	113	108.0	-84.0	ND	dark grey, slow recharge
6/17/2004	L	113	123	118.0	-94.0	<b>0.118</b>	light grey/clear, trace fine sand
6/17/2004	M	123	133	128.0	-104.0	<b>1.31</b>	clear, trace fine sand and silt
6/17/2004	N	133	143	138.0	-114.0	<b>3.08</b>	tan, clear
6/17/2004	O	143	153	148.0	-124.0	<b>2.62</b>	tan, clear
6/17/2004	P	153	163	158.0	-134.0	<b>0.272</b>	tan, clear
6/18/2004	Q	163	173	168.0	-144.0	<b>0.223</b>	light grey, trace fine sand
6/18/2004	R	173	183	178.0	-154.0	<b>0.093</b>	dark grey (purge dry)
N/A	S	183	193	188.0	-164.0	NS	
N/A	T	193	203	198.0	-174.0	NS	
N/A	U	203	213	208.0	-184.0	NS	
N/A	V	213	223	218.0	-194.0	NS	
N/A	W	223	226	224.5	-200.5	NS	

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 24 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

N/A =not applicable

BRL = below reporting limit of 0.01 µg/L

ND = not detected

EDB = ethylene dibromide

NS = not sampled due to low recharge

ft bgs = feet below ground surface

TOS = top of sample

ft msl = feet mean sea level

µg/L = micrograms per liter

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0104**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
6/4/2004	A	2	12	7.0	19.0	ND	no description
6/4/2004	B	12	22	17.0	9.0	ND	no description
6/7/2004	C	22	32	27.0	-1.0	ND	milky grey trace fine sand
6/7/2004	D	32	42	37.0	-11.0	BRL	medium/dark grey, fine sand and silt
6/7/2004	E	42	52	47.0	-21.0	BRL	medium/dark grey, fine sand and silt
6/7/2004	F	52	62	57.0	-31.0	ND	medium light grey, trace fine sand
6/7/2004	G	62	72	67.0	-41.0	ND	medium light grey, trace fine sand
6/7/2004	H	72	82	77.0	-51.0	ND	medium grey/brown lots of fine sand
6/7/2004	I	82	92	87.0	-61.0	ND	light grey, trace fine sand and silt
6/7/2004	J	92	102	97.0	-71.0	ND	very light grey, trace fine sand and silt
6/8/2004	K	102	112	107.0	-81.0	<b>0.136</b>	clear
6/8/2004	L	112	122	117.0	-91.0	<b>0.331</b>	clear
6/8/2004	M	122	132	127.0	-101.0	<b>0.581</b>	very light grey/clear
6/8/2004	N	132	142	137.0	-111.0	<b>0.595</b>	clear
6/8/2004	O	142	152	147.0	-121.0	<b>0.058</b>	clear
6/9/2004	P	152	162	157.0	-131.0	<b>0.062</b>	clear
6/9/2004	Q	162	172	167.0	-141.0	<b>0.027</b>	yellow grey very trace fine sand
6/9/2004	R	172	182	177.0	-151.0	BRL	yellow grey very trace fine sand
6/9/2004	S	182	192	187.0	-161.0	ND	cloudy yellow/grey, trace fine sand
6/9/2004	T	192	202	197.0	-171.0	ND	medium yellow grey

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 25.7 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0105**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
7/22/2004	A	4	14	9.0	22.0	ND	dark brown, silty
7/22/2004	B	14	24	19.0	12.0	ND	grey/brown, fine sand and silt
7/22/2004	C	24	34	29.0	2.0	ND	grey/brown, fine sand and silt
7/22/2004	D	34	44	39.0	-8.0	ND	grey/brown, fine sand and silt
7/22/2004	E	44	54	49.0	-18.0	ND	medium grey, fine sand, trace silt
7/22/2004	F	54	64	59.0	-28.0	ND	medium grey, fine sand, trace silt
7/22/2004	G	64	74	69.0	-38.0	ND	medium grey, fine sand, trace silt
7/22/2004	H	74	84	79.0	-48.0	ND	clear
7/23/2004	I	84	94	89.0	-58.0	ND	clear
7/23/2004	J	94	104	99.0	-68.0	BRL	clear
7/23/2004	K	104	114	109.0	-78.0	0.019	clear
7/23/2004	L	114	124	119.0	-88.0	<b>0.04</b>	clear
7/23/2004	M	124	134	129.0	-98.0	<b>0.058</b>	clear
7/23/2004	N	134	144	139.0	-108.0	<b>0.146</b>	clear
7/23/2004	O	144	154	149.0	-118.0	<b>0.192</b>	slightly cloudy
7/26/2004	P	154	164	159.0	-128.0	<b>0.573</b>	clear
7/26/2004	Q	164	174	169.0	-138.0	<b>0.875</b>	dark grey, lots of fine sand

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 31 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

**Key:**

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0106**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
7/27/2004	A	8	18	13.0	19.8	ND	yellow brown, fine sand and silt
7/27/2004	B	18	28	23.0	9.8	ND	yellow brown, fine sand and silt
7/27/2004	C	28	38	33.0	-0.2	ND	yellow grey, fine sand and silt
7/27/2004	D	38	48	43.0	-10.2	ND	grey yellow, fine sand, trace silt
7/27/2004	E	48	58	53.0	-20.2	ND	cloudy, light grey, fine sand, trace silt
7/27/2004	F	58	68	63.0	-30.2	ND	medium grey, fine sand, trace silt
7/27/2004	G	68	78	73.0	-40.2	ND	light grey cloudy
7/27/2004	H	78	88	83.0	-50.2	ND	medium grey, fine sand, trace silt
7/27/2004	I	88	98	93.0	-60.2	ND	medium grey, trace fine sand
7/27/2004	J	98	108	103.0	-70.2	ND	medium grey, trace fine sand
7/28/2004	K	108	118	113.0	-80.2	ND	clear
7/28/2004	L	118	128	123.0	-90.2	ND	clear
7/28/2004	M	128	138	133.0	-100.2	ND	clear
7/28/2004	N	138	148	143.0	-110.2	BRL	clear
7/28/2004	O	148	158	153.0	-120.2	<b>0.135</b>	clear
7/28/2004	P	158	168	163.0	-130.2	<b>0.362</b>	cloudy, light grey
7/29/2004	Q	168	178	173.0	-140.2	<b>0.091</b>	orange/grey, trace fine silt
7/29/2004	R	178	188	183.0	-150.2	<b>0.077</b>	light grey, trace fine sand
7/29/2004	S	188	198	193.0	-160.2	<b>0.233</b>	clear
7/29/2004	T	198	208	203.0	-170.2	<b>0.106</b>	clear
7/29/2004	U	208	218	213.0	-180.2	<b>0.076</b>	clear
7/29/2004	V	218	228	223.0	-190.2	<b>0.541</b>	clear
7/29/2004	W	228	238	233.0	-200.2	<b>1.38</b>	clear
7/30/2004	X	238	248	243.0	-210.2	<b>0.467</b>	clear

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 32.8 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

**Key:**

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0107**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
7/30/2004	A	7	17	12.0	24.5	ND	golden brown with fine sand and silt
7/30/2004	B	17	27	22.0	14.5	ND	golden brown with fine sand and silt
7/30/2004	C	27	37	32.0	4.5	ND	golden brown with fine sand and silt
7/30/2004	D	37	47	42.0	-5.5	ND	yellow brown with fine sand and silt
8/2/2004	E	47	57	52.0	-15.5	ND	dark green/brown, lots of fine sand (torn screen)
8/2/2004	F	57	67	62.0	-25.5	ND	medium grey with fine sand and silt
8/2/2004	G	67	77	72.0	-35.5	ND	dark grey fine sand and silt
8/2/2004	H	77	87	82.0	-45.5	ND	grey brown with fine sand and silt
8/3/2004	I	87	97	92.0	-55.5	ND	light grey (refusal)

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 36.5 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

**Key:**

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0108**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
7/19/2004	A	3	13	8.0	21.0	ND	light brown, fine sand and silt
7/19/2004	B	13	23	18.0	11.0	ND	grey/brown, fine sand and silt, turbid
7/19/2004	C	23	33	28.0	1.0	ND	grey/brown, fine sand and silt, turbid
7/19/2004	D	33	43	38.0	-9.0	ND	grey/brown, fine sand and silt, turbid
7/19/2004	E	43	53	48.0	-19.0	ND	grey/brown, fine sand and silt, turbid
7/19/2004	F	53	63	58.0	-29.0	ND	light grey, trace fine sand and silt
7/19/2004	G	63	73	68.0	-39.0	ND	light grey, trace fine sand and silt
7/19/2004	H	73	83	78.0	-49.0	ND	light grey, trace fine sand and silt
7/20/2004	I	83	93	88.0	-59.0	ND	cloudy, grey, very trace sand
7/20/2004	J	93	103	98.0	-69.0	ND	clear
7/20/2004	K	103	113	108.0	-79.0	ND	cloudy, grey, very trace sand
7/20/2004	L	113	123	118.0	-89.0	ND	clear
7/20/2004	M	123	133	128.0	-99.0	ND	cloudy, grey, trace fine sand
7/20/2004	N	133	143	138.0	-109.0	ND	cloudy, grey, trace fine sand
7/20/2004	O	143	153	148.0	-119.0	ND	cloudy, grey, trace fine sand
7/21/2004	P	153	163	158.0	-129.0	BRL	clear
7/21/2004	Q	163	173	168.0	-139.0	<b>0.121</b>	clear
7/21/2004	R	173	183	178.0	-149.0	<b>0.73</b>	clear
7/21/2004	S	183	193	188.0	-159.0	<b>1.86</b>	cloudy, very trace fine sand
N/A	T	193	196	194.5	-165.5	NS	

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 29 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

**Key:**

BOS = bottom of sample

BRL = below reporting limit of 0.01 µg/L

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

N/A = not applicable

ND = not detected

NS = not sampled due to low recharge

TOS = top of sample

µg/L = micrograms per liter

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0109**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
8/4/2004	A	3	13	8.0	20.0	ND	dark brown, fine sand and silt
8/4/2004	B	13	23	18.0	10.0	ND	dark golden brown with fine sand and silt
8/4/2004	C	23	33	28.0	0.0	ND	medium golden brown with fine sand and silt
8/4/2004	D	33	43	38.0	-10.0	ND	medium golden brown with fine sand and silt
8/4/2004	E	43	53	48.0	-20.0	ND	medium grey with fine sand
8/4/2004	F	53	63	58.0	-30.0	ND	light yellow, grey trace sand and silt
8/4/2004	G	63	73	68.0	-40.0	BRL	yellow/green some fine sand and silt
8/4/2004	H	73	83	78.0	-50.0	<b>0.056</b>	dark grey to orange with trace fine sand and silt
8/4/2004	I	83	93	88.0	-60.0	<b>0.063</b>	orange/yellow with fine silt
8/4/2004	J	93	103	98.0	-70.0	<b>0.052</b>	yellow with trace fine sand
8/6/2004	K	103	113	108.0	-80.0	<b>0.026</b>	light orange trace fine sand and silt
8/6/2004	L	113	123	118.0	-90.0	BRL	clear
8/6/2004	M	123	133	128.0	-100.0	BRL	clear
8/6/2004	N	133	143	138.0	-110.0	BRL	clear
8/6/2004	O	143	153	148.0	-120.0	ND	clear
8/9/2004	P	153	163	158.0	-130.0	ND	very dark grey with fine sand (purge dry)
8/9/2004	Q	163	173	168.0	-140.0	ND	cloudy light grey with fine sand
8/9/2004	R	173	183	178.0	-150.0	ND	med grey trace fine sand
8/9/2004	S	183	193	188.0	-160.0	ND	orange with silt and trace fine sand
8/9/2004	T	193	203	198.0	-170.0	ND	orange with silt and trace fine sand
8/10/2004	U	203	213	208.0	-180.0	ND	light grey, trace fine sand, no silt
8/10/2004	V	213	223	218.0	-190.0	ND	light grey, trace fine sand, no silt
8/10/2004	W	223	228	225.5	-197.5	ND	medium yellow brown with trace fine sand

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 28 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0110**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
4/6/2005	A	5	12	8.5	17.5	ND	dark red/brown
4/6/2005	B	15	22	18.5	7.5	ND	light brown
4/6/2005	C	25	32	28.5	-2.5	ND	pale yellow
4/6/2005	D	35	42	38.5	-12.5	ND	no description
4/6/2005	E	45	52	48.5	-22.5	ND	very pale brown
4/6/2005	F	55	62	58.5	-32.5	ND	light brown
4/7/2005	G	65	72	68.5	-42.5	ND	light brown
4/7/2005	H	75	82	78.5	-52.5	ND	light brown, clearing
4/7/2005	I	85	92	88.5	-62.5	ND	dark brown
4/7/2005	J	95	102	98.5	-72.5	ND	light brown, lots of fine sand
4/7/2005	K	105	112	108.5	-82.5	ND	light brown, some sand/clearing
4/7/2005	L	115	122	118.5	-92.5	ND	light brown
4/7/2005	M	125	132	128.5	-102.5	ND	light brown/clearing
4/8/2005	N	135	142	138.5	-112.5	ND	light brown/clearing
4/8/2005	O	145	152	148.5	-122.5	ND	light brown, some silt in beaker
4/8/2005	P	155	162	158.5	-132.5	ND	light brown, some silt in beaker
4/8/2005	Q	165	172	168.5	-142.5	ND	greenish grey
4/8/2005	R	175	182	178.5	-152.5	ND	light brown/clearing
4/11/2005	S	185	192	188.5	-162.5	ND	light brown with some silt
4/11/2005	T	195	202	198.5	-172.5	ND	light brown
4/11/2005	U	205	212	208.5	-182.5	ND	light brown/clearing
4/11/2005	V	210	217	213.5	-187.5	ND	pale yellow brown

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 26 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

BRL = below reporting limit of 0.01 µg/L

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

ND = not detected

TOS = top of sample

µg/L = micrograms per liter



**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0111**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
4/12/2005	A	5	12	8.5	15.5	ND	reddish brown
4/12/2005	B	15	22	18.5	5.5	ND	pale reddish brown
4/12/2005	C	25	32	28.5	-4.5	ND	pale yellow brown
4/12/2005	D	35	42	38.5	-14.5	ND	pale brown
4/12/2005	E	45	52	48.5	-24.5	ND	very pale brown
4/12/2005	F	55	62	58.5	-34.5	ND	pale brown, some silt
4/13/2005	G	65	72	68.5	-44.5	ND	greenish grey, silty
4/13/2005	H	75	82	78.5	-54.5	ND	grey very silty
4/13/2005	I	85	92	88.5	-64.5	ND	pale brown, some silt
4/13/2005	J	95	102	98.5	-74.5	ND	grey, very silty
4/13/2005	K	105	112	108.5	-84.5	ND	pale brown, clear
4/13/2005	L	115	122	118.5	-94.5	<b>0.05</b>	pale brown
4/13/2005	M	125	132	128.5	-104.5	BRL	pale brown
4/13/2005	N	135	142	138.5	-114.5	<b>0.027</b>	pale brown
4/14/2005	O	145	152	148.5	-124.5	<b>0.328</b>	pale brown, clear
4/14/2005	P	155	162	158.5	-134.5	<b>0.653</b>	pale brown, yellow
4/14/2005	Q	165	172	168.5	-144.5	<b>0.474</b>	pale brown
4/14/2005	R	175	182	178.5	-154.5	<b>0.067</b>	pale brown, clear
4/14/2005	S	185	192	188.5	-164.5	0.015	light brown, some silt
4/14/2005	T	195	202	198.5	-174.5	0.01	light brown
4/15/2005	U	205	212	208.5	-184.5	BRL	pale brown, clear
4/15/2005	V	215	222	218.5	-194.5	BRL	pale brown
4/15/2005	W	220	227	223.5	-199.5	BRL	pale brown

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 24 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical

Key:

BOS = bottom of sample

BRL = below reporting limit of 0.01 µg/L

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

ND = not detected

TOS = top of sample

µg/L = micrograms per liter

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0112**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
11/22/2004	A	5	11	8.0	16.0	ND	dark brown, fine sand, some silt
11/22/2004	B	15	21	18.0	6.0	ND	tan
11/22/2004	C	25	31	28.0	-4.0	ND	dark grey, clearing to tan
11/22/2004	D	35	41	38.0	-14.0	BRL	light grey, fine sand
11/22/2004	E	45	51	48.0	-24.0	<b>0.027</b>	tan/grey
11/22/2004	F	55	61	58.0	-34.0	0.012	light grey, fine sand
11/22/2004	G	65	71	68.0	-44.0	BRL	grey, lots of fine sand
N/A	H	75	81	78.0	-54.0	NS	abundant fine sand
11/23/2004	I	85	91	88.0	-64.0	ND	grey/tan, very silty
11/23/2004	J	95	101	98.0	-74.0	ND	tan, little fine sand
11/23/2004	K	105	111	108.0	-84.0	ND	tan, little fine sand
11/24/2004	L	115	121	118.0	-94.0	ND	tan, little fine sand
11/24/2004	M	125	131	128.0	-104.0	ND	tan, some silt
11/24/2004	N	135	141	138.0	-114.0	ND	tan, some silt
11/29/2004	O	145	151	148.0	-124.0	ND	yellow/brown
11/30/2004	P	155	161	158.0	-134.0	ND	tan, some silt
11/30/2004	Q	165	171	168.0	-144.0	ND	yellow/orange
11/30/2004	R	175	181	178.0	-154.0	ND	tan, some silt
12/1/2004	S	185	191	188.0	-164.0	ND	tan
12/1/2004	T	194	200	197.0	-173.0	ND	tan

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 24 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

N/A = not applicable

BRL = below reporting limit of 0.01 µg/L

NS = not sampled due to insufficient recharge

EDB = ethylene dibromide

ND = not detected

ft bgs = feet below ground surface

TOS = top of sample

ft msl = feet mean sea level

µg/L = micrograms per liter

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0113**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
12/20/2004	A	10	17	13.5	13.2	ND	light brown
12/20/2004	B	20	27	23.5	3.2	<b>0.034</b>	pale yellow
12/20/2004	C	30	37	33.5	-6.8	<b>0.381</b>	pale grey, fine sand and silt
12/20/2004	D	40	47	43.5	-16.8	<b>0.34</b>	pale grey, fine sand and silt
12/20/2004	E	50	57	53.5	-26.8	BRL	light brown, some silt
12/20/2004	F	60	67	63.5	-36.8	ND	light grey
12/20/2004	G	70	77	73.5	-46.8	ND	light brown
1/7/2005	H	80	87	83.5	-56.8	ND	light brown/clearing
1/7/2005	I	90	97	93.5	-66.8	ND	yellow orange
1/7/2005	J	100	107	103.5	-76.8	ND	yellow orange
1/7/2005	K	110	117	113.5	-86.8	ND	light brown
1/7/2005	L	120	127	123.5	-96.8	ND	light brown, some silt
1/7/2005	M	130	137	133.5	-106.8	ND	light brown
1/7/2005	N	140	147	143.5	-116.8	ND	light brown
1/12/2005	O	150	157	153.5	-126.8	NR <sup>1</sup>	greenish/grey, tight
1/13/2005	P	160	167	163.5	-136.8	ND	grey turning tan
1/13/2005	Q	170	177	173.5	-146.8	ND	yellow brown
1/13/2005	R	180	187	183.5	-156.8	ND	tan

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 26.7 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

1. Sample was evaluated and determined not to be a representative groundwater sample. (Information presented and discussed at 5/10/06 Technical Update Meeting)

Key:

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

NR = not representative

EDB = ethylene dibromide

TOS = top of sample

ft bgs = feet below ground surface

µg/L = micrograms per liter

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0114**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
12/13/2004	A	10	16.8	13.4	14.1	ND	very dark brown
12/13/2004	B	20	26.8	23.4	4.1	ND	pale brown
12/13/2004	C	30	36.8	33.4	-5.9	ND	yellow orange
12/13/2004	D	40	46.8	43.4	-15.9	ND	pale yellow
12/13/2004	E	50	56.8	53.4	-25.9	ND	yellow orange
12/13/2004	F	60	66.8	63.4	-35.9	ND	olive brown, very silty
12/13/2004	G	70	76.8	73.4	-45.9	ND	pale yellow
12/13/2004	H	80	86.8	83.4	-55.9	ND	light olive brown, clear
12/14/2004	I	90	97	93.5	-66.0	ND	no description
12/14/2004	J	100	107	103.5	-76.0	BRL	yellow brown
12/14/2004	K	110	117	113.5	-86.0	<b>0.13</b>	yellow brown, clear
12/14/2004	L	120	127	123.5	-96.0	<b>0.755</b>	light brown, clear
12/14/2004	M	130	137	133.5	-106.0	<b>0.699</b>	yellow brown, some silt
12/14/2004	N	140	147	143.5	-116.0	<b>0.567</b>	yellow brown, some silt
12/15/2004	O	150	157	153.5	-126.0	<b>0.205</b>	light brown
12/15/2004	P	160	167	163.5	-136.0	<b>0.079</b>	no description
12/15/2004	Q	170	177	173.5	-146.0	<b>0.048</b>	no description
12/15/2004	R	180	185	182.5	-155.0	BRL	brownish grey, very silty

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 27.5 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0115**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
12/6/2004	A	10	17	13.5	13.1	ND	dark grey
12/6/2004	B	20	27	23.5	3.1	ND	light grey
12/6/2004	C	30	37	33.5	-6.9	ND	light grey
12/6/2004	D	40	47	43.5	-16.9	ND	light grey
12/6/2004	E	50	57	53.5	-26.9	ND	yellow orange
12/6/2004	F	60	67	63.5	-36.9	ND	yellow brown
12/7/2004	G	70	77	73.5	-46.9	ND	pale yellow
12/7/2004	H	80	87	83.5	-56.9	ND	olive yellow, silty
12/7/2004	I	90	97	93.5	-66.9	ND	olive yellow, silty
12/7/2004	J	100	107	103.5	-76.9	ND	light yellow brown, grey silt settling out in beaker
12/7/2004	K	110	117	113.5	-86.9	ND	light yellow
12/7/2004	L	120	127	123.5	-96.9	ND	light grey, silty
12/8/2004	M	130	137	133.5	-106.9	ND	light yellow brown
12/8/2004	N	140	147	143.5	-116.9	ND	yellow brown, some silt
12/8/2004	O	150	157	153.5	-126.9	ND	yellow brown
12/8/2004	P	160	167	163.5	-136.9	ND	light brown
12/9/2004	Q	170	177	173.5	-146.9	ND	yellow brown
12/9/2004	R	180	187	183.5	-156.9	ND	light brown, silt

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 26.6 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0116**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
1/19/2005	A	10	17	13.5	18.5	ND	brown, some silt
1/19/2005	B	20	27	23.5	8.5	ND	light brown, clearing
1/19/2005	C	30	37	33.5	-1.5	ND	tan
1/19/2005	D	40	47	43.5	-11.5	ND	tan
1/19/2005	E	50	57	53.5	-21.5	ND	tan, some silt
1/19/2005	F	60	67	63.5	-31.5	ND	very sandy
1/19/2005	*	70	77	73.5	-41.5	NS	running sands
3/10/2005	G	80	87	83.5	-51.5	ND	green/grey, very sandy
3/10/2005	H	90	97	93.5	-61.5	ND	brownish tan
3/10/2005	I	100	107	103.5	-71.5	0.01	no description
3/10/2005	J	110	117	113.5	-81.5	<b>0.029</b>	no description
3/10/2005	K	120	127	123.5	-91.5	<b>0.626</b>	tan
3/11/2005	L	130	137	133.5	-101.5	<b>0.389</b>	yellow/orange, clearing
3/11/2005	M	140	147	143.5	-111.5	<b>0.112</b>	yellow orange
3/11/2005	N	150	157	153.5	-121.5	<b>0.075</b>	yellow orange
3/11/2005	O	160	167	163.5	-131.5	<b>0.036</b>	tan
3/14/2005	P	170	177	173.5	-141.5	0.015	light brown, clearing
3/14/2005	Q	180	187	183.5	-151.5	ND	light brown, clearing
3/14/2005	R	190	197	193.5	-161.5	ND	light brown, clearing

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 32 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

\* = interval not sampled

Key:

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

NS = not sampled

EDB = ethylene dibromide

TOS = top of sample

ft bgs = feet below ground surface

µg/L = micrograms per liter

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0117**

**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
5/16/2005	A	15	22	18.5	8.5	ND	olive brown, silty, trace sand
5/16/2005	B	25	32	28.5	-1.5	ND	olive brown, silty, trace sand
5/16/2005	C	35	42	38.5	-11.5	<b>0.099</b>	light grey, cloudy, trace fine sand
5/16/2005	D	45	52	48.5	-21.5	0.01	light grey, cloudy, trace fine sand
5/16/2005	E	55	62	58.5	-31.5	BRL	grey/brown, lots of fine sand
NS	F	65	72	68.5	-41.5	NS	running fine grey sand
5/16/2005	G	75	82	78.5	-51.5	ND	running fine grey sand (tight)
5/18/2005	H	85	92	88.5	-61.5	ND	grey, some fine sand
5/18/2005	I	95	102	98.5	-71.5	ND	grey, some fine sand
5/18/2005	J	105	112	108.5	-81.5	ND	cloudy, light grey, trace fine sand
5/18/2005	K	115	122	118.5	-91.5	ND	slightly cloudy, grey
5/18/2005	L	125	132	128.5	-101.5	ND	slightly cloudy, grey
5/18/2005	M	135	142	138.5	-111.5	ND	slightly cloudy, grey
5/18/2005	N	145	152	148.5	-121.5	ND	slightly cloudy, grey

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 27 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

**Key:**

BOS = bottom of sample

BRL = below reporting limit of 0.01 µg/L

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

N/A = not applicable

ND = not detected

TOS = top of sample

µg/L = micrograms per liter

**FS-28 Borehole Groundwater Screening Results  
Direct Push Location 69DP0118**

**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
6/29/2005	A	35	40	37.5	6.5	ND	light yellow brown, fine sand
6/29/2005	B	45	50	47.5	-3.5	ND	light yellow brown, fine sand
6/29/2005	C	55	60	57.5	-13.5	ND	pale yellow, clearing
6/29/2005	D	65	70	67.5	-23.5	ND	light yellow brown, some fine sand/clearing
6/29/2005	E	75	80	77.5	-33.5	ND	grey/greenish grey, very fine sand
6/29/2005	F	85	90	87.5	-43.5	ND	same as above - clearing to pale yellow
6/30/2005	G	95	100	97.5	-53.5	ND	light yellowish brown
6/30/2005	H	105	110	107.5	-63.5	ND	light yellowish brown
6/30/2005	I	115	120	117.5	-73.5	BRL	light yellowish brown some fine sand
6/30/2005	J	125	130	127.5	-83.5	0.02	light yellowish brown some fine sand
6/30/2005	K	135	140	137.5	-93.5	<b>0.12</b>	light yellow brown higher silt content
6/30/2005	L	145	150	147.5	-103.5	<b>0.357</b>	light olive brown
6/30/2005	M	155	160	157.5	-113.5	<b>0.399</b>	light olive brown
7/5/2005	N	165	170	167.5	-123.5	<b>0.162</b>	light olive brown
7/5/2005	O	175	180	177.5	-133.5	<b>0.099</b>	light olive brown
7/5/2005	P	185	190	187.5	-143.5	<b>0.044</b>	light olive brown
7/5/2005	Q	195	200	197.5	-153.5	<b>0.048</b>	light yellow brown/clearing
7/5/2005	R	205	210	207.5	-163.5	ND	olive grey to yellow brown
7/6/2005	S	215	220	217.5	-173.5	ND	olive brown, very slow recharge
7/6/2005	T	225	230	227.5	-183.5	ND	greyish brown (purge dry)

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 44 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

69PZ0017A,B installed adjacent to direct push boring.

Key:

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level



**FS-28 Borehole Groundwater Screening Results  
Direct Push Location 69DP0119**

**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
7/7/2005	A	25	30	27.5	6.5	ND	yellow brown, some fine sand
7/7/2005	B	35	40	37.5	-3.5	ND	yellow brown, some fine sand
7/7/2005	C	45	50	47.5	-13.5	ND	yellow brown, some fine sand
7/7/2005	D	55	60	57.5	-23.5	ND	pale yellow
7/7/2005	E	65	70	67.5	-33.5	ND	pale yellow
7/7/2005	F	75	80	77.5	-43.5	ND	greyish brown
7/8/2005	G	85	90	87.5	-53.5	ND	grey/brown, very turbid
7/8/2005	H	95	100	97.5	-63.5	ND	light olive brown/clear
7/8/2005	I	105	110	107.5	-73.5	ND	light yellowish brown
7/8/2005	J	115	120	117.5	-83.5	ND	light olive brown
7/11/2005	K	125	130	127.5	-93.5	ND	light yellow brown, clearing
7/11/2005	L	135	140	137.5	-103.5	ND	light yellow brown, clearing
7/11/2005	M	145	150	147.5	-113.5	ND	light yellow brown (purge dry)
7/11/2005	N	155	160	157.5	-123.5	ND	light yellowish brown
7/11/2005	O	165	170	167.5	-133.5	ND	light yellowish brown
7/12/2005	P	175	180	177.5	-143.5	ND	light olive brown, some silt
7/12/2005	Q	185	190	187.5	-153.5	ND	pale yellow/ clearing
7/12/2005	R	195	200	197.5	-163.5	ND	light olive brown, clearing
7/12/2005	S	205	210	207.5	-173.5	ND	pale yellow
7/12/2005	T	210	220	215.0	-181.0	ND	light olive brown (purge dry)

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 34 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

69PZ0018A,B installed adjacent to direct push boring.

**Key:**

BOS = bottom of sample

ND = not detected

EDB = ethylene dibromide

TOS = top of sample

ft bgs = feet below ground surface

µg/L = micrograms per liter

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0120**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
8/2/2005	A	25	30	27.5	-5.5	ND	light grey, fine silt
8/2/2005	B	30	35	32.5	-10.5	ND	pale yellow/light grey
8/2/2005	C	40	45	42.5	-20.5	ND	pale yellow, some silt
8/2/2005	D	50	55	52.5	-30.5	ND	light grey
8/2/2005	E	60	65	62.5	-40.5	ND	light grey
8/2/2005	F	70	75	72.5	-50.5	ND	grey, fine sands
8/3/2005	G	80	85	82.5	-60.5	ND	cloudy, grey, trace fine sand
8/3/2005	H	90	95	92.5	-70.5	ND	light yellow grey, some fine sand
8/3/2005	I	100	105	102.5	-80.5	ND	almost clear
8/3/2005	J	110	115	112.5	-90.5	ND	clear
8/3/2005	K	120	125	122.5	-100.5	ND	clear
8/3/2005	L	130	135	132.5	-110.5	ND	clear
8/3/2005	M	140	145	142.5	-120.5	ND	slightly cloudy
8/4/2005	N	150	155	152.5	-130.5	ND	clear
8/4/2005	O	160	165	162.5	-140.5	ND	slightly cloudy
8/4/2005	P	170	175	172.5	-150.5	ND	slightly cloudy
8/4/2005	Q	180	185	182.5	-160.5	ND	clear
8/4/2005	R	190	195	192.5	-170.5	ND	light grey, trace fine sand
8/5/2005	S	200	205	202.5	-180.5	BRL	light yellow grey, trace fine sand
8/5/2005	T	210	215	212.5	-190.5	BRL	yellow/grey, trace fine sand

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 22 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0121**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
8/9/2005	A	10	15	12.5	8.5	ND	no description
8/9/2005	B	20	25	22.5	-1.5	ND	light grey, fine silt
8/9/2005	C	30	35	32.5	-11.5	ND	light grey
8/9/2005	D	40	45	42.5	-21.5	ND	pale yellow/light grey
8/9/2005	E	50	55	52.5	-31.5	ND	pale yellow, some silt
8/9/2005	F	60	65	62.5	-41.5	ND	light grey
N/A	*	70	75	72.5	-51.5	NS	running sands - no sample taken
8/10/2005	G	80	85	82.5	-61.5	ND	no description
8/10/2005	H	90	95	92.5	-71.5	ND	cloudy, light grey
8/10/2005	I	100	105	102.5	-81.5	ND	brown, silty
8/10/2005	J	110	115	112.5	-91.5	ND	cloudy, light grey
8/10/2005	K	120	125	122.5	-101.5	ND	cloudy, light grey
8/10/2005	L	130	135	132.5	-111.5	ND	cloudy, light grey
8/11/2005	M	140	145	142.5	-121.5	ND	clear
8/11/2005	N	150	155	152.5	-131.5	ND	clear
8/11/2005	O	160	165	162.5	-141.5	ND	cloudy, light grey
8/11/2005	P	170	175	172.5	-151.5	ND	clear
8/11/2005	Q	180	185	182.5	-161.5	ND	clear
8/12/2005	R	190	195	192.5	-171.5	BRL	clear
8/12/2005	S	200	205	202.5	-181.5	BRL	clear

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 21 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

\* = interval could not be sampled due to low recharge.

Key:

BOS = bottom of sample

BRL = below reporting limit of 0.01 µg/L

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

N/A = not applicable

ND = not detected

NS = not sampled due to low recharge

TOS = top of sample

µg/L = micrograms per liter

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0122**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
7/26/2005	A	20	25	22.5	0.5	ND	light grey/brown
7/26/2005	B	30	35	32.5	-9.5	ND	light grey/brown, trace fine sand
7/26/2005	C	40	45	42.5	-19.5	ND	light grey with fine sand
7/27/2005	D	50	55	52.5	-29.5	ND	light grey, trace fine sand
7/27/2005	E	60	65	62.5	-39.5	ND	cloudy, very light grey/yellow
7/27/2005	F	70	75	72.5	-49.5	ND	cloudy, light grey/yellow
7/27/2005	G	80	85	82.5	-59.5	ND	dark grey, lots of fine sand
7/27/2005	H	90	95	92.5	-69.5	ND	cloudy, light grey, trace fine sand
7/27/2005	I	100	105	102.5	-79.5	ND	cloudy, light grey, trace fine sand
7/27/2005	J	110	115	112.5	-89.5	ND	clear
7/28/2005	K	120	125	122.5	-99.5	ND	slightly cloudy, trace fine sand
7/28/2005	L	130	135	132.5	-109.5	ND	slightly cloudy, trace fine sand
7/28/2005	M	140	145	142.5	-119.5	ND	clear
7/28/2005	N	150	155	152.5	-129.5	ND	clear
7/28/2005	O	160	165	162.5	-139.5	ND	slight cloudy, very trace fine sand
7/28/2005	P	170	175	172.5	-149.5	ND	clear
7/29/2005	Q	180	185	182.5	-159.5	ND	cloudy, light grey
7/29/2005	R	190	195	192.5	-169.5	ND	cloudy, light grey
7/29/2005	S	200	205	202.5	-179.5	ND	purged dry

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 23 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

ND = not detected

EDB = ethylene dibromide

TOS = top of sample

ft bgs = feet below ground surface

µg/L = micrograms per liter

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0123**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
8/16/2005	A	15	20	17.5	9.5	ND	light yellowish brown, some fine sand
8/16/2005	B	25	30	27.5	-0.5	ND	light olive brown
N/A	*	35	40	37.5	-10.5	NS	dry
8/16/2005	C	45	50	47.5	-20.5	<b>0.079</b>	light yellowish brown
8/16/2005	D	55	60	57.5	-30.5	ND	olive grey
8/16/2005	E	65	70	67.5	-40.5	ND	olive grey
8/16/2005	F	75	80	77.5	-50.5	ND	olive grey, fine running sands
8/18/2005	G	85	90	87.5	-60.5	ND	pale olive grey little sand
8/18/2005	H	95	100	97.5	-70.5	ND	pale olive grey little sand
8/18/2005	I	105	110	107.5	-80.5	ND	pale yellow
8/18/2005	J	115	120	117.5	-90.5	ND	pale yellow
8/18/2005	K	125	130	127.5	-100.5	ND	pale olive
8/18/2005	L	135	140	137.5	-110.5	ND	pale yellow
8/19/2005	M	145	150	147.5	-120.5	ND	pale olive (purge dry)
8/19/2005	N	155	160	157.5	-130.5	ND	light yellowish brown
8/19/2005	O	165	170	167.5	-140.5	ND	light yellowish brown
8/19/2005	P	175	180	177.5	-150.5	ND	light yellowish brown
8/22/2005	Q	185	190	187.5	-160.5	ND	light olive brown (purge dry)

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 27 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

\* = interval could not be sampled due to low recharge.

69DP0019A,B installed adjacent to direct push boring.

**Key:**

BOS = bottom of sample

N/A = not applicable

EDB = ethylene dibromide

NS = not sampled due to extremely low recharge

ft bgs = feet below ground surface

TOS = top of sample

ft msl = feet mean sea level

µg/L = micrograms per liter

MMCL = Massachusetts Maximum Contaminant Level

ND = not detected

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0124**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
9/1/2005	A	45	50	47.5	10.5	ND	yellow brown, fine sand and silt
9/1/2005	B	55	60	57.5	0.5	ND	orange brown, fine sand and silt
9/1/2005	C	65	70	67.5	-9.5	ND	dark grey, lots of fine sand -clearing
9/6/2005	D	75	80	77.5	-19.5	ND	dark grey-clearing with trace fine sand
9/6/2005	E	85	90	87.5	-29.5	ND	dark grey-clearing with trace fine sand
9/6/2005	F	95	100	97.5	-39.5	ND	dark grey-clearing with trace fine sand
9/6/2005	G	105	110	107.5	-49.5	ND	clear, trace fine sand
9/6/2005	H	115	120	117.5	-59.5	ND	cloudy, light grey, trace fine sand
9/6/2005	I	125	130	127.5	-69.5	ND	medium grey, fine sand (purge dry)
9/6/2005	J	135	140	137.5	-79.5	ND	medium grey, fine sand (purge dry)
9/7/2005	K	145	150	147.5	-89.5	ND	cloudy grey/green, trace fine sand
9/7/2005	L	155	160	157.5	-99.5	ND	clear
9/7/2005	M	165	170	167.5	-109.5	ND	initially dark grey - clearing (purge dry 2x)
9/8/2005	N	175	180	177.5	-119.5	ND	dark grey, lots of fine sand and silt
9/8/2005	O	185	190	187.5	-129.5	ND	dark grey, silty - clear by end

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 58 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

**Key:**

BOS = bottom of sample

ND = not detected

ft bgs = feet below ground surface

TOS = top of sample

ft msl = feet mean sea level

µg/L = micrograms per liter

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0125**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
9/9/2005	A	45	50	47.5	6.5	ND	grey/yellow, trace fine sand
9/9/2005	B	55	60	57.5	-3.5	ND	cloudy, light grey, very trace fine sand
9/9/2005	C	65	70	67.5	-13.5	ND	dark grey, lots of very fine sand - clearing
9/9/2005	D	75	80	77.5	-23.5	ND	light brown/yellow, trace fine sand
9/9/2005	E	85	90	87.5	-33.5	ND	yellow, trace fine sand - clearing
9/9/2005	F	95	100	97.5	-43.5	ND	medium grey with silt -clearing
9/12/2005	G	105	110	107.5	-53.5	ND	cloudy, olive yellow, trace silt
9/12/2005	H	115	120	117.5	-63.5	ND	light grey, silty-clearing
9/12/2005	I	125	130	127.5	-73.5	ND	cloudy, light grey, trace silt
9/12/2005	J	135	140	137.5	-83.5	ND	cloudy, light grey, trace silt
9/12/2005	K	145	150	147.5	-93.5	ND	cloudy, grey with silt and sand (tight)
9/12/2005	L	155	160	157.5	-103.5	ND	cloudy grey
9/13/2005	M	165	170	167.5	-113.5	ND	cloudy, light grey, trace silt
9/13/2005	N	175	180	177.5	-123.5	ND	light olive brown trace silt

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 54 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

Key:

BOS = bottom of sample

ND = not detected

EDB = ethylene dibromide

TOS = top of sample

ft bgs = feet below ground surface

µg/L = micrograms per liter

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0126**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
9/19/2005	A	45	50	47.5	6.5	ND	light yellow, trace fine sand
9/19/2005	B	55	60	57.5	-3.5	ND	light olive brown, trace fine sand
9/20/2005	C	65	70	67.5	-13.5	ND	light yellow brown/light grey, trace silt
9/20/2005	D	75	80	77.5	-23.5	ND	light grey, trace silt
9/20/2005	E	85	90	87.5	-33.5	ND	light grey, trace silt
9/20/2005	F	95	100	97.5	-43.5	ND	light grey, trace silt
9/20/2005	G	105	110	107.5	-53.5	ND	grey, trace silt
9/20/2005	H	115	120	117.5	-63.5	ND	pale olive with silt (purge dry)
9/20/2005	I	125	130	127.5	-73.5	ND	pale olive to grey with trace silt
9/21/2005	J	135	140	137.5	-83.5	ND	light brown with sand and silt (slow recharge)
9/21/2005	K	145	150	147.5	-93.5	ND	light brown with trace sand
9/21/2005	L	155	160	157.5	-103.5	ND	light brown with trace sand
9/21/2005	M	165	170	167.5	-113.5	ND	light brown with trace silt
9/22/2005	N	175	180	177.5	-123.5	ND	olive brown-clearing to light grey, trace silt
9/22/2005	O	185	190	187.5	-133.5	ND	light brown, trace silt
9/22/2005	P	195	200	197.5	-143.5	ND	light brown, trace silt

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 54 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

**Key:**

BOS = bottom of sample

ND = not detected

ft bgs = feet below ground surface

TOS = top of sample

ft msl = feet mean sea level

µg/L = micrograms per liter

MMCL = Massachusetts Maximum Contaminant Level



**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0127**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
9/23/2005	A	55	60	57.5	2.5	ND	no description
9/27/2005	B	65	70	67.5	-7.5	ND	light olive brown, trace silt and sand
9/27/2005	C	75	80	77.5	-17.5	ND	cloudy olive brown, silt and sand
9/27/2005	D	85	90	87.5	-27.5	ND	light olive brown, fine sand, silt
9/27/2005	E	95	100	97.5	-37.5	ND	light olive brown/grey, trace silt
9/27/2005	F	105	110	107.5	-47.5	ND	dark grey, silty
9/27/2005	G	115	120	117.5	-57.5	ND	light grey, trace silt
9/28/2005	H	125	130	127.5	-67.5	ND	yellow/brown, trace fine sand
9/28/2005	I	135	140	137.5	-77.5	ND	light brown, silty, clearing to grey cloudy
9/28/2005	J	145	150	147.5	-87.5	ND	light brown, silty, clearing to grey cloudy
9/28/2005	K	155	160	157.5	-97.5	ND	olive silt and sand present
9/28/2005	L	165	170	167.5	-107.5	ND	clearing to light grey, trace silt
9/28/2005	M	175	180	177.5	-117.5	ND	light yellow brown trace fine sand
9/29/2005	N	185	190	187.5	-127.5	ND	light grey, trace silt
9/29/2005	O	195	200	197.5	-137.5	ND	clear
9/30/2005	P	205	210	207.5	-147.5	ND	light brown, trace silt and sand
9/30/2005	Q	215	220	217.5	-157.5	ND	light brown, trace silt and sand

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 60 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

69PZ0020A,B installed adjacent to direct push boring

**Key:**

BOS = bottom of sample

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

ND = not detected

TOS = top of sample

µg/L = micrograms per liter

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0128**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
10/11/2005	A	25	30	27.5	3.5	ND	olive yellow, silt, trace sand
10/11/2005	B	35	40	37.5	-6.5	ND	cloudy, grey, silt, trace sand
10/11/2005	C	45	50	47.5	-16.5	ND	cloudy
10/11/2005	D	55	60	57.5	-26.5	ND	cloudy, grey
10/11/2005	E	65	70	67.5	-36.5	ND	cloudy, grey
10/11/2005	F	75	80	77.5	-46.5	ND	medium to dark grey, silt and sand present
10/12/2005	G	85	90	87.5	-56.5	ND	olive brown, trace sand and silt
10/12/2005	H	95	100	97.5	-66.5	ND	light grey, little sand and silt
10/12/2005	I	105	110	107.5	-76.5	ND	cloudy, olive brown to light grey
10/12/2005	J	115	120	117.5	-86.5	ND	yellow-brown to light grey, trace sand and silt
10/12/2005	K	125	130	127.5	-96.5	ND	light yellow-brown to light grey
10/12/2005	L	135	140	137.5	-106.5	ND	light olive brown to light grey, trace silt
10/12/2005	M	145	150	147.5	-116.5	ND	cloudy, light grey, medium silt
10/13/2005	N	155	160	157.5	-126.5	ND	cloudy, grey with fine sand and silt
10/13/2005	O	165	170	167.5	-136.5	ND	light grey, trace silt
10/13/2005	P	175	180	177.5	-146.5	ND	light grey, trace silt
10/13/2005	Q	185	190	187.5	-156.5	ND	light grey, trace silt
10/14/2005	R	195	200	197.5	-166.5	ND	light grey, trace silt

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 31 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

69PZ0021A,B installed adjacent to direct push boring.

**Key:**

BOS = bottom of sample

ND = not detected

EDB = ethylene dibromide

TOS = top of sample

ft bgs = feet below ground surface

µg/L = micrograms per liter

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0129**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
10/21/2005	A	15	20	17.5	6.5	ND	no description
10/21/2005	B	25	30	27.5	-3.5	ND	light olive brown to dark grey with silt
10/21/2005	C	35	40	37.5	-13.5	ND	olive, with silt
10/21/2005	D	45	50	47.5	-23.5	BRL	cloudy, tan, trace silt and sand
10/21/2005	E	55	60	57.5	-33.5	ND	light brown, cloudy trace silt and sand
10/21/2005	F	65	70	67.5	-43.5	ND	light brown, cloudy trace silt and sand
10/24/2005	G	75	80	77.5	-53.5	ND	olive cloudy, some silt and trace sand
10/24/2005	H	85	90	87.5	-63.5	ND	olive trace silt and sand to light grey
10/24/2005	I	95	100	97.5	-73.5	ND	light grey trace silt and sand
10/24/2005	J	105	110	107.5	-83.5	ND	light grey small silt and sand
10/24/2005	K	115	120	117.5	-93.5	ND	light grey small silt and sand
10/24/2005	L	125	130	127.5	-103.5	ND	light grey minimal silt and sand
10/24/2005	M	135	140	137.5	-113.5	ND	greyish
10/26/2005	N	145	150	147.5	-123.5	ND	light grey trace silt and sand
10/26/2005	O	155	160	157.5	-133.5	ND	light grey
10/26/2005	P	165	170	167.5	-143.5	ND	light brown
10/26/2005	Q	175	180	177.5	-153.5	ND	light brown trace silt and sand
10/26/2005	R	185	190	187.5	-163.5	ND	cloudy light brown
10/27/2005	S	195	200	197.5	-173.5	ND	light grey trace silt and sand
10/27/2005	T	205	210	207.5	-183.5	ND	no description (purge dry)

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 24 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

69PZ0005A,B installed adjacent to direct push boring.

Key:

BOS = bottom of sample

ND = not detected

BRL = below reporting limit of 0.01 µg/L

TOS = top of sample

EDB = ethylene dibromide

µg/L = micrograms per liter

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0130**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
11/15/2005	A	10	15	12.5	13.5	ND	olive yellow, trace sand and silt
11/15/2005	B	20	25	22.5	3.5	ND	cloudy, light yellow, trace sand and silt
11/15/2005	C	30	35	32.5	-6.5	ND	cloudy, olive, trace sand and silt
11/15/2005	D	40	45	42.5	-16.5	ND	cloudy, olive, trace sand and silt
11/15/2005	E	50	55	52.5	-26.5	ND	light yellowish brown, trace sand and silt
11/15/2005	F	60	65	62.5	-36.5	ND	tan, trace sand and silt
11/15/2005	G	70	75	72.5	-46.5	ND	light grey, trace sand and silt
11/16/2005	H	80	85	82.5	-56.5	ND	greyish, sand and silt present
11/16/2005	I	90	95	92.5	-66.5	ND	light brown, silt, trace sand
11/16/2005	J	100	105	102.5	-76.5	ND	light grey, trace sand and silt
11/16/2005	K	110	115	112.5	-86.5	ND	light grey, cloudy, medium silt and sand
11/16/2005	L	120	125	122.5	-96.5	ND	light grey, cloudy, silt, trace sand
11/16/2005	M	130	135	132.5	-106.5	ND	grey, sand and silt present
11/16/2005	N	140	145	142.5	-116.5	ND	grey, sand and silt present
11/17/2005	O	150	155	152.5	-126.5	ND	light grey silty - clearing
11/17/2005	P	160	165	162.5	-136.5	ND	light grey, trace sand and silt
11/17/2005	Q	170	175	172.5	-146.5	ND	light brown/tan
N/A	R	180	185	182.5	-156.5	NS	purge dry
N/A	S	190	195	192.5	-166.5	NS	purge dry

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 26 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

69PZ0022A,B installed adjacent to direct push boring.

Key:

BOS = bottom of sample

ND = not detected

EDB = ethylene dibromide

NS = not sampled due to low recharge

ft bgs = feet below ground surface

TOS = top of sample

ft msl = feet mean sea level

µg/L = micrograms per liter

MMCL = Massachusetts Maximum Contaminant Level

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69DP0131**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
11/29/2005	A	30	35	32.5	15.5	ND	light olive brown, trace sand and silt
11/29/2005	B	40	45	42.5	5.5	ND	yellowish brown
11/29/2005	C	50	55	52.5	-4.5	ND	olive, trace sand and silt
11/29/2005	D	60	65	62.5	-14.5	ND	olive, trace sand and silt
11/29/2005	E	70	75	72.5	-24.5	ND	tannish, sand and silt
11/29/2005	F	80	85	82.5	-34.5	ND	olive/light-brown, trace sand and silt
11/30/2005	G	90	95	92.5	-44.5	ND	light grey, medium silt and fine sand
11/30/2005	H	100	105	102.5	-54.5	ND	greyish, silt present
11/30/2005	I	110	115	112.5	-64.5	0.015	light brown, medium silt
11/30/2005	J	120	125	122.5	-74.5	BRL	light olive brown, trace sand and silt
11/30/2005	K	130	135	132.5	-84.5	0.016	cloudy, light olive brown
11/30/2005	L	140	145	142.5	-94.5	<b>0.147</b>	cloudy, yellow-brown
12/1/2005	M	150	155	152.5	-104.5	<b>0.146</b>	light olive
12/1/2005	N	160	165	162.5	-114.5	<b>0.168</b>	yellow-grey
12/1/2005	O	170	175	172.5	-124.5	<b>0.193</b>	brownish-grey, hard drilling
12/1/2005	P	180	185	182.5	-134.5	<b>0.168</b>	yellowish-grey, hard drilling
12/1/2005	Q	190	195	192.5	-144.5	0.019	slightly cloudy, grey
12/2/2005	R	200	205	202.5	-154.5	<b>0.023</b>	light grey, trace silt
12/2/2005	S	210	215	212.5	-164.5	BRL	grey, slightly cloudy
12/2/2005	T	220	225	222.5	-174.5	ND	olive grey, silty
12/5/2005	U	230	235	232.5	-184.5	NR <sup>1</sup>	

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 48 ft msl.

Bold indicates concentrations exceed the MMCL.

All samples were analyzed by Groundwater Analytical at the on-site lab.

1. Sample was evaluated and determined not to be a representative groundwater sample. (Information presented and discussed at 5/10/06 Technical Update Meeting)

Key:

BOS = bottom of sample

BRL = below reporting limit of 0.01 µg/L

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

ND = not detected

NR = not representative

TOS = top of sample

µg/L = micrograms per liter



# WELL CONSTRUCTION DIAGRAM

LOCATION: 69MW0012A

FS-28

Project Name: FS-28

Location: INSTALLED WITH 69PZ0012AB

Project Number: 187615

Northing: 222810.72

Easting: 852340.29

Ground Surface Elevation: 33.18

Drilling Contractor: Boart Longyear Co.

MP Elevation (ft msl): 32.72

Measuring Point: TOC

Drilling Equipment: #1509 GP24-300RS

Date Started: 7/18/2005

Date Finished: 7/26/2005

Drilling Method: Sonication

Sampling Method: Core Barrel/Sub Pump

Total Depth Drilled (ft bgs): 253

Const. Materials: SCH 80 PVC

Borehole Diameter (in.): 7.625

Well Diameter (in.): 2.5

Screen Slot Size (in): 0.01

Well Depth (ft bgs): 155.17

First Water (ft bgs): 12.0

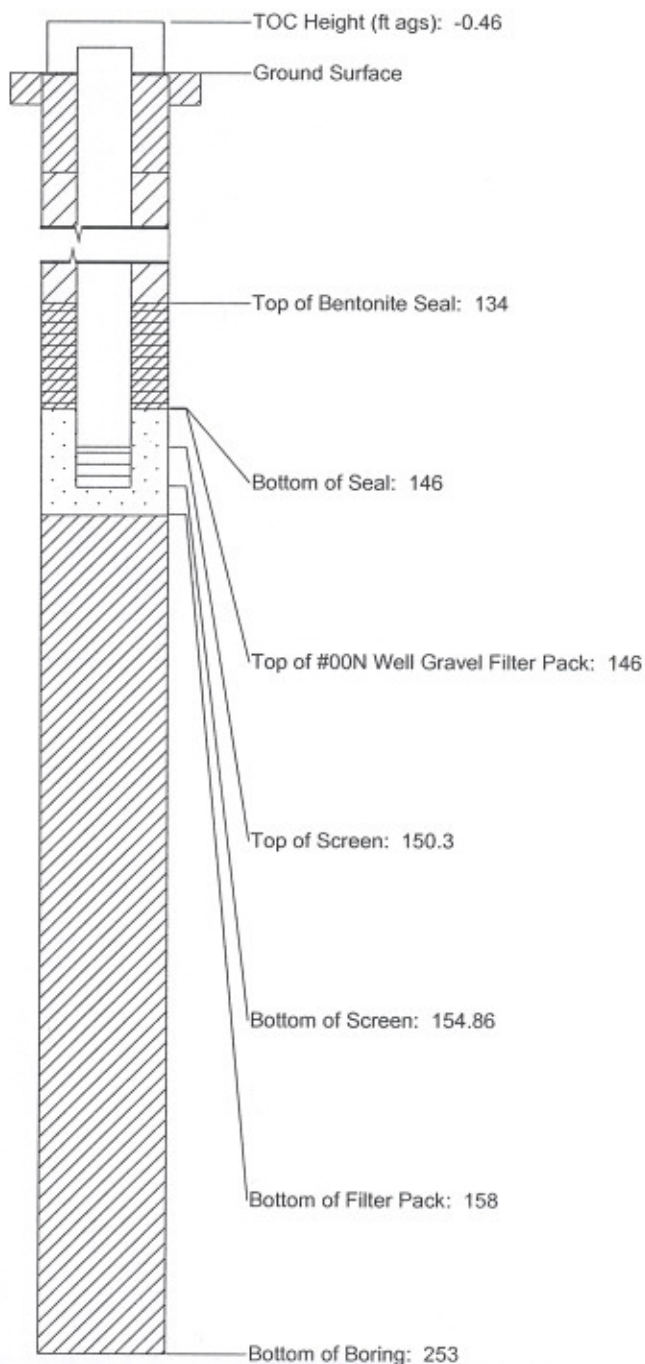
Logged By: M. Greenberg

Reviewed By: CH2M HILL

Completion: Flush mount

Static Water (ft btoc): 7.97  
Date Measured: 7/19/2005

LOCID: 69MW0012A



All depths shown in ft bgs

Drawing Not to Scale

**FS-28 Borehole Groundwater Screening Results**  
**Sonic Location 69MW0012A**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L
7/18/2005	A	30	35	32.5	-2.5	ND
7/18/2005	B	40	45	42.5	-12.5	ND
7/18/2005	C	50	55	52.5	-22.5	ND
7/18/2005	D	60	65	62.5	-32.5	ND
7/18/2005	E	70	75	72.5	-42.5	ND
7/18/2005	F	80	85	82.5	-52.5	ND
7/18/2005	G	90	95	92.5	-62.5	ND
7/18/2005	H	100	105	102.5	-72.5	ND
7/19/2005	I	110	115	112.5	-82.5	ND
7/19/2005	J	120	125	122.5	-92.5	ND
7/19/2005	K	130	135	132.5	-102.5	ND
7/20/2005	L	140	145	142.5	-112.5	ND
7/20/2005	M	150	155	152.5	-122.5	ND
7/20/2005	N	160	165	162.5	-132.5	ND
7/22/2005	O	170	175	172.5	-142.5	ND
N/A	P	180	185	182.5	-152.5	NS
N/A	Q	190	195	192.5	-162.5	NS
N/A	R	200	205	202.5	-172.5	NS
7/21/2005	S	210	215	212.5	-182.5	ND
7/22/2005	T	220	225	222.5	-192.5	ND
7/22/2005	U	230	235	232.5	-202.5	ND
7/22/2005	V	240	245	242.5	30.0	ND

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 30 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

69PZ0012A,B installed in same boring with monitoring well.

Key:

BOS = bottom of sample

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

N/A = not applicable

ND = not detected

NS = not sampled due to low recharge

TOS = top of sample

µg/L = micrograms per liter



**LOCATION: 69MW0012A**

Project Name: FS-28		Location: INSTALLED WITH 69PZ0012AB		
Project Number: 187615	Northing: 222810.72	Easting: 852340.29	Ground Surface Elevation: 33.18	
Drilling Contractor: Boart Longyear Co.	MP Elevation ft (MSL): 32.72		Measuring Point: TOC	
Drilling Equipment: #1509 GP24-300RS	Date Started: 7/18/2005		Date Finished: 7/26/2005	
Drilling Method: Sonication	Total Depth Drilled ft (BGS): 253		First Water ft (BGS): 12.0	
Sampling Method: Core Barrel/Sub Pump	Borehole Diameter (in.): 7.625		Well Diameter (in.): 2.5	
Const. Materials: SCH 80 PVC	Well Depth ft (BGS): 155.17		Static Water ft (BTOC): 7.97	
Logged By: M. Greenberg	Reviewed By: CH2M HILL	Completion: Flush mount		Date Measured: 7/19/2005

Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval / Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)
0			No soil logging performed from 0-12.3 ft. bgs.					
5			MONITORING WELL 69MW0012A IS INSTALLED IN THE SAME BORING WITH TWO PIEZOMETERS, 69PZ0012A AND 69PZ0012B.					
10								
15				4.0/5.3	SP	SAND: 2.5Y 6/3 light yellowish brown, medium grained, some fine sand, trace to little coarse sand, trace silt, trace rounded fine to coarse gravel, wet.		20
20				1.1/1.2	SP	SAND: 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, saturated.		15
25			Some amount of the bottom of core run was dropped from barrel before sample bags were put in place to be filled.	6.5/4.7	SP	SAND: 2.5Y 6/3 light yellowish brown, medium grained, some fine sand, trace to little coarse sand, trace silt, trace rounded fine to coarse gravel, wet.		10
30	13				NSNR	SAND: 2.5Y 6/3 light yellowish brown, medium grained, some fine sand, trace to little coarse sand, trace silt, trace rounded fine to coarse gravel, wet.		5
35			35-55 ft.: Soft drilling conditions present.		SP	SAND: 2.5Y 5/4 light olive brown, medium		0



**LOCATION: 69MW0012A**

Project Name:FS-28					Location: INSTALLED WITH 69PZ0012AB				
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)	
40	12		55-75 ft.: Soft drilling conditions present.	2.0/1.9		grained, some fine sand, trace coarse sand, trace subrounded to rounded fine to coarse gravel, trace silt, saturated.		-5	
					SP	SAND: 2.5Y 5/3 light olive brown, fine grained, little medium sand, trace coarse sand, trace silt, saturated.			
					SP				
ML	SAND: 2.5Y 6/6 olive yellow, fine to medium grained, trace coarse sand, trace silt, saturated. SILT: 2.5Y 6/3 light yellowish brown, wet.	-10							
45	12.5				SP	SAND: 2.5Y 6/2 light brownish gray, medium grained, little fine sand, trace coarse sand, wet.		-15	
NSNR					No Recovery.	-20			
50									
55	13				1.6/1.3	SP		SAND: 2.5Y 6/4 light yellowish brown, fine to medium grained, trace silt, trace coarse sand, wet.	-25
SP				SAND: 2.5Y 6/4 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, wet.		-30			
SP				SAND: 2.5Y 6/2 light brownish gray, fine grained, trace to little medium sand, trace silt, wet.					
60			SP	SAND: 2.5Y 6/2 light brownish gray, fine to medium grained, trace coarse sand, trace silt, wet.		-35			
65	13		1.5/1.4	NSNR	No Recovery.				
70						-40			
75				SP	SAND: 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, trace rounded fine to coarse gravel, wet.	-45			
80	12		75-95 ft.: Fairly easy drilling conditions present.	2.6/2.1	SP	SAND: 2.5Y 5/6 light olive brown, medium grained, little fine sand, trace to little coarse sand, trace silt, trace rounded fine to coarse gravel, saturated.			

Project Name:FS-28					Location: INSTALLED WITH 69PZ0012AB				
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)	
85	12			0.6/1.5	SP	SAND: 10YR 5/6 yellowish brown, medium grained, little coarse sand, trace to little fine sand, trace to little rounded fine to coarse gravel, trace silt, saturated.		-50	
SP						-55			
SP					SAND: 2.5Y 5/6 light olive brown, medium grained, little fine sand, trace to little coarse sand, trace silt, trace rounded fine to coarse gravel, saturated.				
90	12			0.6/1.5	NSNR	SAND: 2.5Y 5/4 light olive brown, medium grained, some fine sand, little coarse sand, trace silt, trace rounded fine to coarse gravel, saturated.		-60	
					No Recovery.	-65			
SP					SAND: 2.5Y 5/4 light olive brown, medium grained, some fine sand, trace to little coarse sand, trace silt, trace rounded fine to coarse gravel, saturated.				
95	13			1.2/0.8				-70	
								-75	
100	12			1.5/0.8	SP	SAND: 10YR 5/6 yellowish brown, medium grained, little fine sand, little coarse sand, trace silt, trace subrounded to rounded fine to coarse gravel, saturated.		-80	
SP						-85			
NSNR					SAND: 2.5Y 5/4 light olive brown, fine grained, trace medium sand, trace silt, saturated.				
105	12			1.5/0.8		No Recovery.		-90	
GP					GRAVELLY SAND, 10YR 5/6 yellowish brown, medium to coarse grained sand, subangular to subrounded fine to coarse gravel, trace silt, trace fine sand, saturated.	-95			
SP					SAND: 5Y 5/1 gray (10YR 5/6 yellowish brown mottling); fine to medium grained, trace to little silt, trace coarse sand, trace subrounded fine to coarse gravel.				
110	12			1.7/1.8	SP	SAND: 5Y 5/1 gray, fine grained, some medium sand, little silt, trace coarse sand, trace rounded fine to coarse gravel, saturated.		-90	
								-95	
115	12		115-135 ft.: Driller reports relatively easy drilling conditions.					-100	
								-105	
120	12							-110	
								-115	
125	12							-120	
								-125	




Project Name:FS-28					Location: INSTALLED WITH 69PZ0012AB				
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)	
130	0.43			0.8/1.0					
					ML	SILT: 5Y 4/1 dark gray, little fine sand, trace clay, damp.		-100	
					NSNR	No Recovery.			
135			135-155 ft.: Driller reported firm, but not difficult, drilling conditions. Some soil extended above top of core barrel into rods.		SP	SAND: 5Y 5/1 gray, fine grained, some medium sand, little silt, trace coarse sand, trace rounded fine to coarse gravel, saturated.		-105	
140	12			4.6/3.6	SP	SAND: 2.5Y 6/4 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, saturated.		-110	
145								-115	
150	11.5			3.4/5.7				-120	
					ML	CLAYEY SILT: 2.5Y 5/1 gray, laminated, damp.			
					SP	SAND: 2.5Y 6/3 light yellowish brown, fine grained, some medium sand, trace to little silt, wet.			
155			155-175 ft.: Driller reported easy drilling conditions.		NSNR	No Recovery.		-125	
					SP	SAND: 2.5Y 6/3 light yellowish brown, medium grained, some fine sand, trace to little coarse sand, trace silt, trace subangular fine to coarse gravel, saturated.			
160	7.5			2.8/4.4				-130	
					SP	SAND: 2.5Y 6/1 gray, fine to medium grained, trace coarse sand, trace silt, saturated.			
165								-135	
					SP	SAND: 5Y 4/1 dark gray, fine grained, little medium sand, trace to little silt, saturated.			
170	1.68			2.3/3.1	SM	SILTY SAND: 2.5Y 4/1 dark gray, fine grained, trace medium sand, wet, hard.		-140	
					SCSM	SAND and CLAYEY SILT: 5Y 3/1 very dark gray, very fine sand, trace subangular fine gravel, trace coarse sand, dry, hard.			
					SP	SAND: 2.5Y 5/1 gray, fine grained, some medium sand, little silt, trace coarse sand, trace subangular fine gravel, interbedded with clayey			
175			175-189 ft.: Hard drilling conditions present through		SM				

Project Name: FS-28					Location: INSTALLED WITH 69PZ0012AB			
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval / Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)
180			core run. Core barrel was pulled out before a 20-foot run because it was not advancing past 189 feet.	3.1/3.4	ML	<p>silt, wet.</p> <p>SILT and SAND: 5Y 4/1 dark gray, fine grained, trace subrounded fine to coarse gravel, trace medium to coarse sand, moist.</p> <p>SANDY SILT: 5Y 3/1 very dark gray, very fine sand, little clay, trace subrounded to rounded fine gravel, trace coarse sand, dry, hard.</p>		-145
185								-150
190			189-205 ft.: Drilling conditions were easier due to sand/silt near bottom of core run. Driller said that large amount of clay in upper portion caused expansion of soil into rods.	2.4/2.9	ML	SANDY SILT: 5Y 3/1 very dark gray, very fine sand, trace subrounded to rounded fine gravel, trace coarse sand, trace clay, trace fine sand lenses, dry, hard.		-155
195								-160
200				2.3/2.3	SPSM	SAND: 5Y 5/2 olive gray, fine grained, some silt, trace clay, moist.		-165
205					SM	SANDY SILT: 5Y 5/2 olive gray, fine grained, wet.		-170
210	0.65		205-225 ft.: Drilling was difficult through interval.	0.5/0.8	ML	SILT: 5Y 4/2 olive gray, little fine sand, damp.		-175
215								-180
220	2.72			1.6/0.7	SP	SAND: 5Y 5/2 olive gray, fine grained, little silt,		-185



**LOCATION: 69MW0012A**

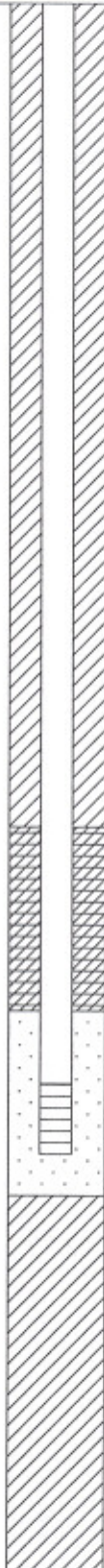
Project Name: FS-28					Location: INSTALLED WITH 69PZ0012AB				
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)	
225	7.14			1.5/2.4	NSNR	wet. No Recovery.		-190	
		SP			SAND: 2.5Y 5/1 gray, fine grained, some medium sand, trace to little silt, trace coarse sand, trace subrounded fine to coarse gravel, saturated.	-195			
230									
235	1.25			3.8/2.5	SP	SAND: 2.5Y 5/1 gray, fine grained, some medium sand, little silt, trace rounded coarse gravel, trace coarse sand, saturated.		-200	
		SP			SAND: 2.5Y 5/1 gray, fine grained, some medium sand, trace to little silt, trace coarse sand, trace subrounded fine to coarse gravel, saturated.	-205			
240		SP			SAND: 2.5Y 5/1 gray, fine grained, little silt, little medium sand, trace coarse sand, trace subangular to rounded fine to coarse gravel, saturated.	-210			
		SP			SAND: 2.5Y 6/1 gray, fine grained, some medium sand, trace to little silt, trace to little subrounded fine gravel, trace coarse sand, saturated.	-215			
245		NSNR			No Recovery.	-220			
		CM			SAND: 2.5Y 5/2 grayish brown, fine grained, little medium sand, little silt, trace coarse sand, trace subrounded fine gravel, wet.	-225			
250					BEDROCK: fine-grained igneous rock, grades to coarse-grained granite at approximately 247.8 feet.	-230			
255	Notes: 1. Well Depth: 155.17 ft. bgs 2. SCH 80 PVC Screens 3. Screen length: 4.56 feet 4. Screen Interval: 150.3 - 154.86 ft. bgs 5. Slot Size: 0.01 in.  Printed on 4/3/2006							-225	
260								-225	
265								-230	

At 246 feet, very hard material was encountered. A stronger bit is needed to advance further.  
 246-253 ft.: Very hard drilling conditions present through core run.





**LOCATION: 69MW0012A**

Project Name:FS-28										Location: INSTALLED WITH 69PZ0012AB				
Depth (ft-bgs)	Sample ID	Interval (ft)	Headspace (ppm)	Purge vol (gal)	Purge Rate (gpm)	Temperature (c)	pH (units)	ORP (mV)	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Remarks	Well Construction Diagram	Elevation (ft msl)
85	CHPK00012FO0105	0.3		250	12	14.61	5.82	-2.2	85	2.23	3.3	Initial purge is light yellow brown with trace fine sand. Purge clears quickly. No odor detected.		-50
90	CHPK00012GO0105	0.3		195	12	13.86	5.87	32.4	85	0.32	5.2	Initial purge is light yellow brown with trace fine sand. Purge clears quickly. No odor detected.		-55
95												-60		
100	CHPK00012HO0105			305	13	13.74	5.74	108.7	93	0.48	7.2	Initial purge is light yellow brown with little fine sand. No odor detected.		-65
105												-70		
110	CHPK00012IO0105	8		195	12	13.28	6.44	5.6	81	4.53	5.2	Initial purge is light brown with trace fine sand. Purge clears fairly quickly. No odor detected.		-75
115												-80		
120	CHPK00012JO0105	5.5		332	12	13.58	6.31	22.8	86	8.29	15.8	Initial purge is light olive brown turning to light yellow brown, with fine to medium sand. Purge clears slowly. No odor detected.		-85
125												-90		
130	CHPK00012KO0105	0		173	0.43	24.13	6.12	-62.9	106	5.61	52.9	Initial purge is gray with fine sand and silt. Purge remains gray, cloudy, very slow. No odor detected.		-95
135												-100		
140	CHPK00012LO0105	33.6		390	12	13.2	6.17	-11.5	84	1.75	54.2	Initial purge is light olive brown, cloudy, and silty. No odor detected.	-105	
145												-110		
150	CHPK00012MO0105			190	11.5	14.21	5.76	-43.3	83	1.95	1052.4	Initial purge is olive gray with fine sand, cloudy, silty, very turbid. It does not clear.	-115	
155												-120		
160	CHPK00012NO0105	0		325	7.5	15.02	6.09	-43.7	86	1.72	712.5	Initial purge is gray with trace fine sand, cloudy, and silty.	-125	
165												-130		
170	CHPK00012OO0105	0		230	1.68	18.91	5.96	-98.4	114	4.07	481.2	Initial purge is gray with trace fine sand, cloudy, and very silty.	-135	
175												-140		
180												No sample attempted due to presence of dry, dense silt.	-145	



LOCATION: 69MW0012A

Project Name:FS-28

Location: INSTALLED WITH 69PZ0012AB

[illegible]





Loc ID: 69MW1306AB

EDB RI/FS

Project Name: EDB RI/FS DATA GAP				Location: EDB RI/FS			
Project Number: 35K78408		Northing: 221775.2		221775.1		Easting: 853147.9	
Drilling Contractor: Boart Longyear				Elevation: 25.36		25.36 ft (MSL)	
Drilling Equipment: Guspech GP24				Date Started: 12/18/96		Date Finished: 12/20/96	
Drilling Method: Rotosonic				Total Depth Drilled: 245.0		ft (BGS)	
Sampling Method: Rotosonic Core Barrel				Borehole Diameter: 8.0, 6.0 inch		Well Diameter: 2.5 inch	
Const. Materials: SCH 80 PVC				Well Depth: 110.0		210.0 ft (BGS)	
Logged by: T. Zimmerly		Reviewed by: R. Guraishi		Completion: Flushmount		Date Measured: 01/03/97	

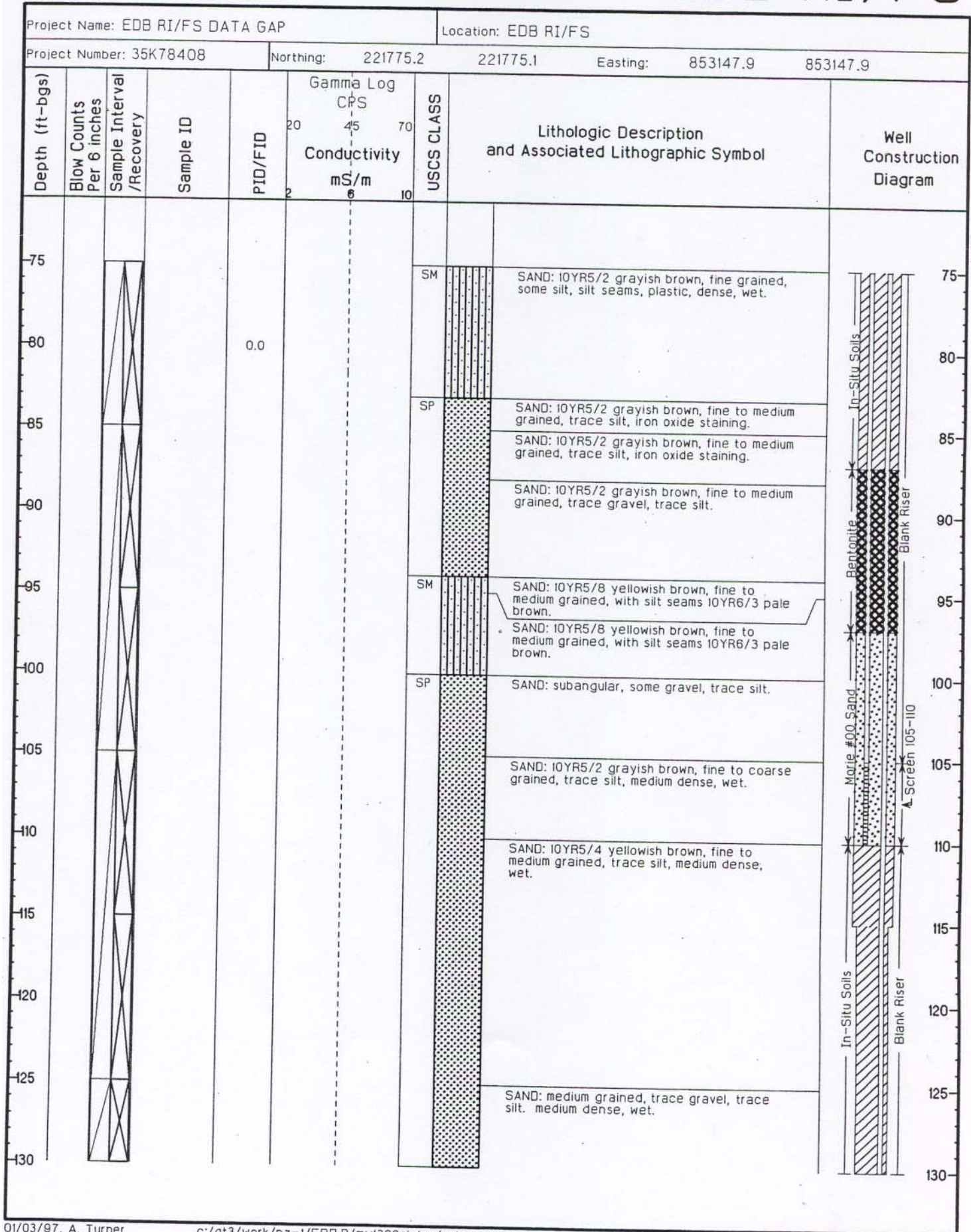
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Sample ID	PID/FID	Gamma Log CPS 20 45 70 Conductivity mS/m 2 6 10	USCS CLASS	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram
0						SP	SAND: 10YR4/4 dark yellowish brown, fine to coarse grained, trace silt, some gravel, loose, wet.	
5							SAND: 10YR4/4 dark yellowish brown, fine to coarse grained, trace silt, some fine gravel, loose, wet.	
10							SAND: 10YR4/6 dark yellowish brown, medium grained, trace to little gravel, trace silt, loose, wet.	
15				0.0			SAND: 10YR4/4 dark yellowish brown, medium to coarse grained, trace gravel, trace silt, loose to medium dense, wet.	
20							SAND: 10YR6/3 pale brown, fine grained, trace gravel, trace silt, loose to medium dense, wet.	
25							SAND: 10YR6/3 pale brown, medium to coarse grained, trace silt, trace gravel, medium dense, wet.	
30								
35								
40								
45				1.2			SAND: 10YR6/3 pale brown, medium to coarse grained, trace silt, trace gravel, medium dense, wet.	
50							GRAVELLY SAND: 10YR6/3 pale brown, coarse grained, trace silt, subangular to subrounded gravel, loose, wet.	
55							SAND: 10YR6/3 pale brown, fine to coarse grained, trace to little gravel, trace silt, loose, wet.	
60							SAND: 10YR6/3 pale brown, coarse grained, trace to little gravel, trace silt, loose, wet.	
65				8.2			SAND: 10YR6/3 pale brown, coarse grained, trace to little gravel, trace silt, loose, wet.	
70				4.0				
75						SM	SILTY SAND: Some gravel.	





Loc ID: 69MW1306AB

EDB RI/FS



Project Name: EDB RI/FS DATA GAP				Location: EDB RI/FS					
Project Number: 35K78408		Northing: 221775.2		221775.1		Easting: 853147.9		853147.9	
Depth (ft-bgs)	Blow Counts Per 6 inches	Sample Interval /Recovery	Sample ID	PID/FID	Gamma Log CPS Conductivity mS/m	USCS CLASS	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	
185						SP/SM	GRAVELLY SAND: 10YR5/6 yellowish brown, fine to coarse grained, trace silt, subangular to subrounded gravel, trace cobbles.		185
190							SAND: coarse grained, little silt, trace to little gravel.		190
195									195
200						SM	SAND: 10YR5/6 yellowish brown, little fine to coarse gravel, some silt in layers, medium dense, wet. SAND: 10YR5/6 yellow brown, with gravel, trace silt in layers, medium dense, wet.		200
205						SC	CLAYEY SAND: 10YR5/6 yellow brown, little fine to coarse gravel, trace silt in layers, medium dense, wet.		205
210				0.0		SP	SAND: 10YR4/1 dark gray, fine to coarse grained, trace silt, with subangular gravel, damp to moist.		210
215						CL	SILTY SANDY CLAY: 10YR4/1 dark gray, hard, wet, medium plastic.		215
220									220
225						SM	SAND: 10YR4/6 dark yellowish brown, fine to coarse grained, little silt, trace gravel.		225
230									230
235						SC	SILTY CLAYEY SAND: 10YR4/1 dark gray, fine to coarse sand. SILTY SAND: 10YR4/2 dark gray brown, with large cobbles, rounded, wet. SAND: 10YR4/2 dark grayish brown, coarse grained, with large rounded cobbles, wet.		235
240						ML			240





Loc ID: 69MW1306AB

EDB RI/FS

Project Name: EDB RI/FS DATA GAP

Location: EDB RI/FS

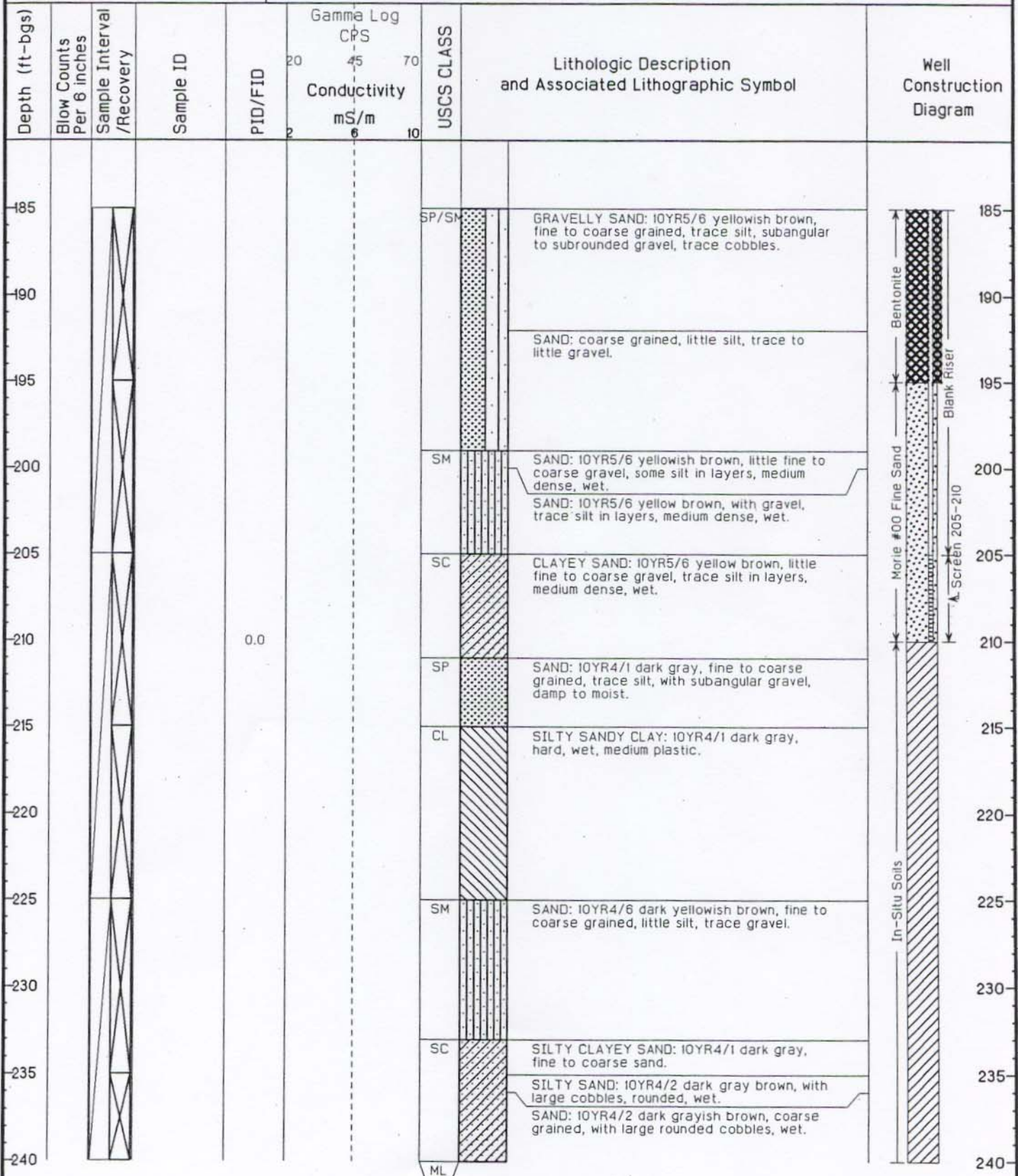
Project Number: 35K78408

Northing: 221775.2

221775.1

Easting: 853147.9

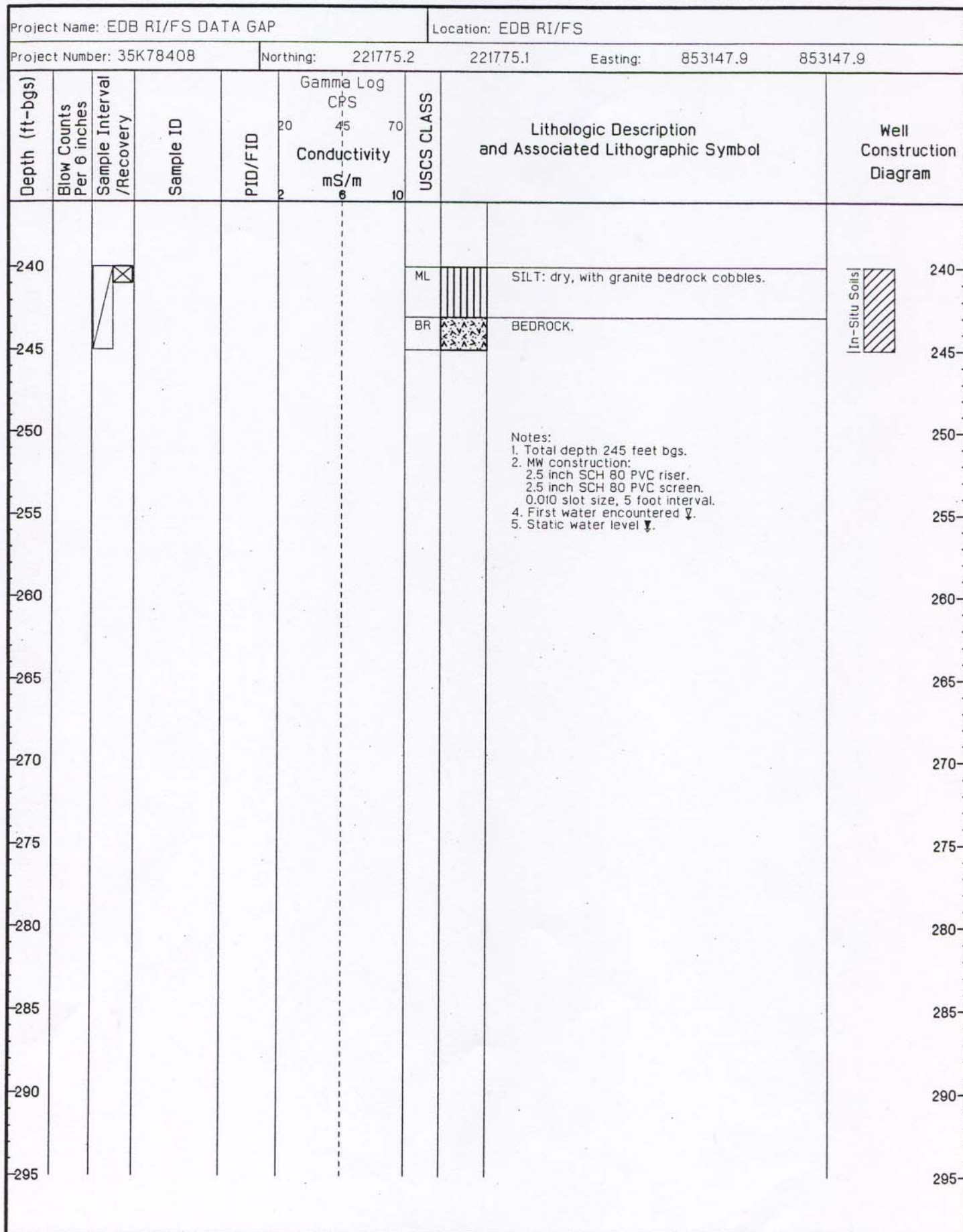
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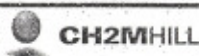


Loc ID: 69MW1306AB

EDB RI/FS





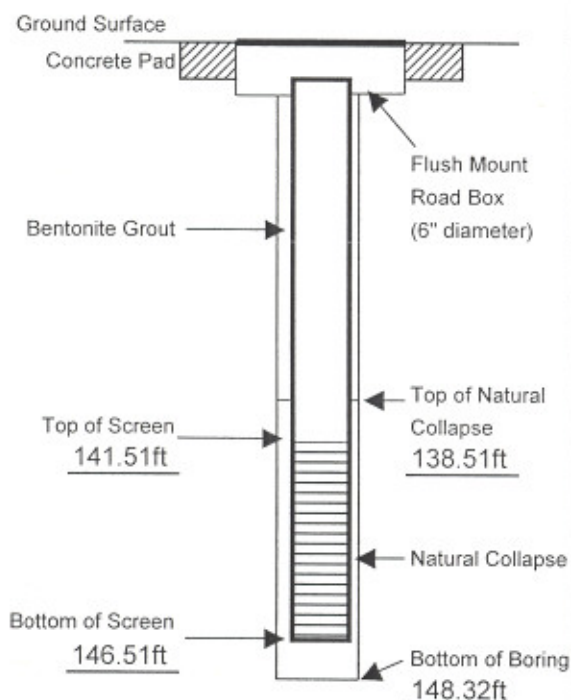


## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name: FS-28  
Project Number: 324146-SPEIM-FS28  
Date Started: 8-Nov-05  
Date Completed: 14-Nov-05  
Rig Type: Geoprobe 6620DT  
Rig Operator: T.O'Connell/T. Irvine  
Borehole Diameter (In): 2.1  
Well Diameter (In): 0.5

LOC ID: 69MW1306C  
Total Borehole Depth: 148.32ft  
Total Well Depth: 146.51ft  
Construction Materials: Schedule 40 PVC  
MP Elevation: 25.48 ft msl  
Surface Elevation: 25.73 ft msl  
Northing: 221771.8  
Easting: 853144.6

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

Well Cap: Geoprobe Systems, Inc.

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

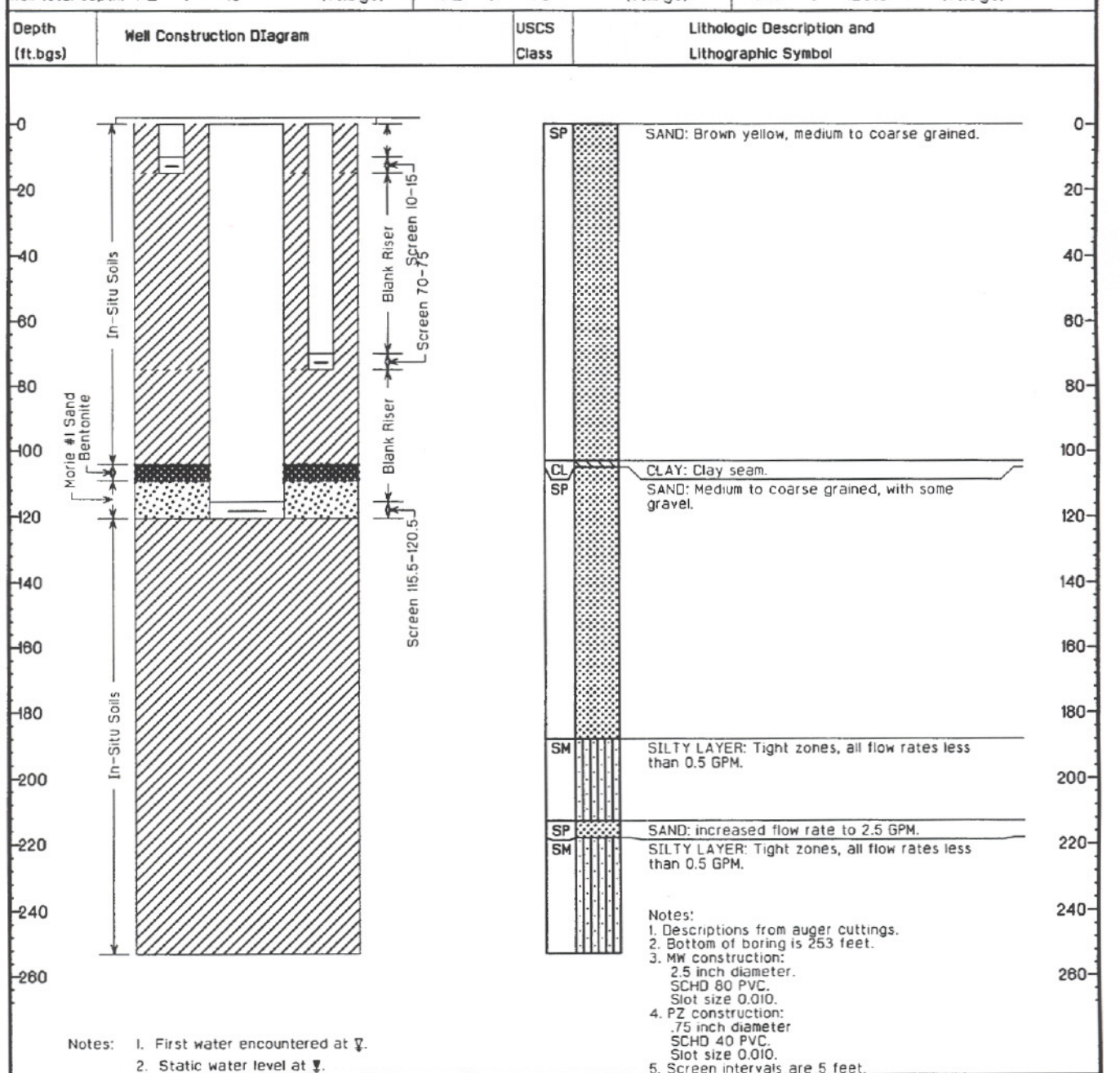
FIRST WATER: 3.83 ft  
REFUSAL: not encountered  
OTHER:



69MW1308

EDB RI/FS

Project Name: EDB RI/FS Data Gap		Location: EDB RI/FS	
Project Number: 35K78408	Well ID: 69MW1308	Northing: 221764.8	Easting: 853376.2
Drilling Contractor: LaFramboise		Elevation: 26.72 feet above mean sea level	
Drilling Equipment: Failing F-10		Date Started: 12/30/96	Date Finished: 01/03/97
Drilling Method: Screened Hollow Stem Auger		Total Depth Drilled: 253 feet	
Sampling Method: Auger cuttings		Borehole Diameter: 8.5 inch	Well Diameter: 2 1/2 inch MW, 3/4 inch P
Const. Materials: SCH 80 PVC MW, SCH 40 PVC PZ		First Water: NM feet (bgs)	Static Water: 2.7 feet (bgs)
Logged by: D. Coppi		Reviewed by: T. Szymoniak	Completion: Flushmount
Well total depth: PZ : 15 (ft.bgs)		PZ : 75 (ft.bgs)	MW : 120.5 (ft.bgs)



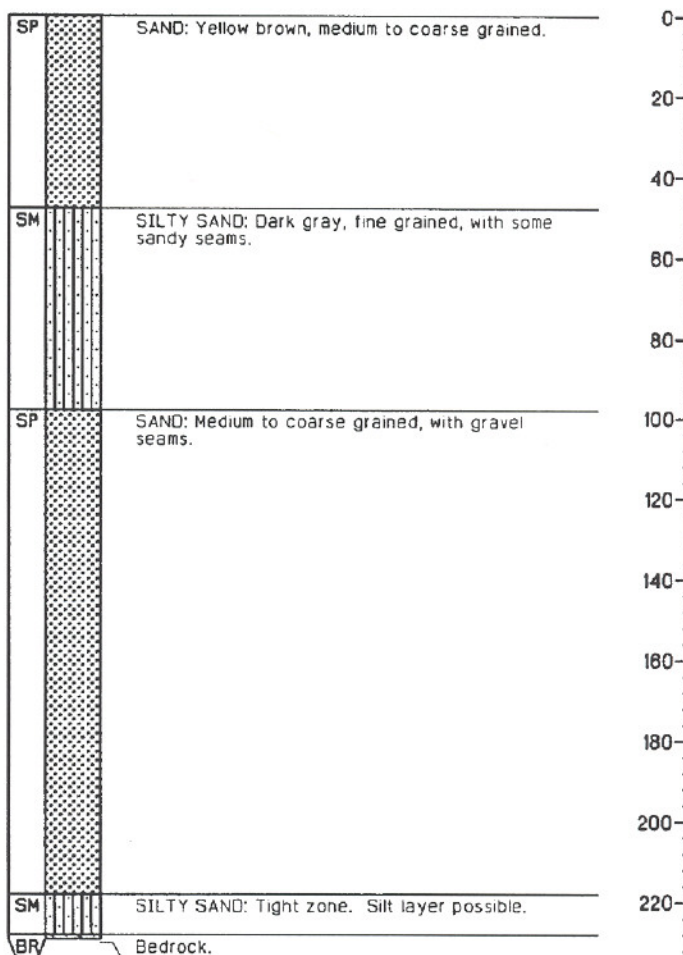
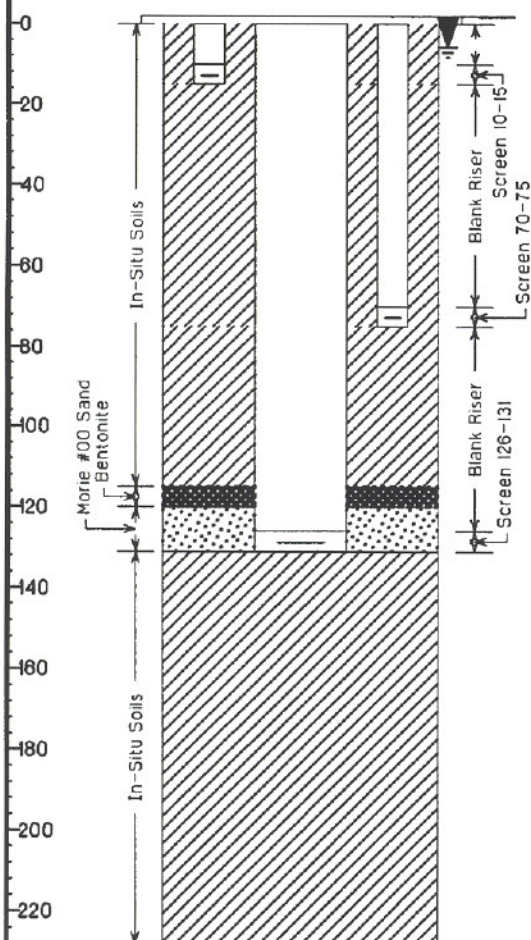


69MW1309

EDB RI/FS

Project Name: EDB RI/FS Data Gap		Location: EDB RI/FS	
Project Number: 35K78408	Well ID: 69MW1309	Northing: 221709.2	Easting: 853511.5
Drilling Contractor: LaFramboise		Elevation: 27.06	feet above mean sea level
Drilling Equipment: Failing F-10		Date Started: 01/06/97	Date Finished: 01/08/97
Drilling Method: Screened Hollow Stem Auger		Total Depth Drilled: 228 feet	
Sampling Method: Auger cuttings		Borehole Diameter: 8.5 inch	Well Diameter: 2 1/2" MW, 3/4" PZ
Const. Materials: SCH 80 PVC MW, SCH 40 PVC PZ		First Water: NM	feet (bgs)
Logged by: G. Martin		Reviewed by: T. Szymoniak	Completion: Flushmount
Well total depth: PZ : 15 (ft.bgs)		MW : 131 (ft.bgs)	PZ : 75 (ft.bgs)

Depth (ft.bgs)	Well Construction Diagram	USCS Class	Lithologic Description and Lithographic Symbol
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Notes: 1. First water encountered at 7.  
2. Static water level at 7.

Notes:  
1. Descriptions from auger cuttings.  
2. Bottom of boring is 228 feet.  
3. MW construction:  
2.5 inch diameter,  
SCHD 80 PVC.  
Slot size 0.010.  
4. PZ construction:  
.75 inch diameter  
SCHD 40 PVC.  
Slot size 0.010.  
5. Screen intervals are 5 feet.





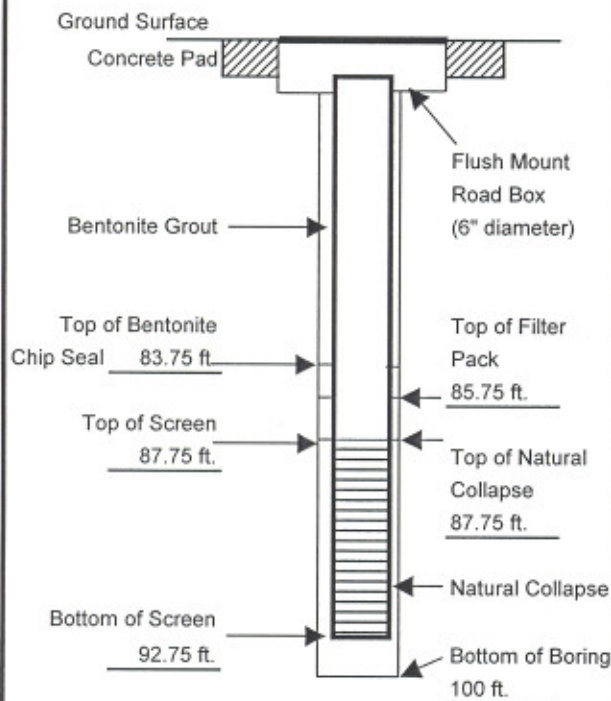
## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name: FS-28  
Project Number: 324146-SPEIM-FS28  
Date Started: 21-Apr-05  
Date Completed: 25-Apr-05  
Rig Type: Geoprobe 6620DT  
Rig Operator: M. Gifford / T. Irvine  
Borehole Diameter (In): 2.125  
Well Diameter (In): 0.5

LOC ID: 69MW1317C  
Total Borehole Depth: 100 ft. bgs  
Total Well Depth: 92.75 ft. bgs  
Construction Materials: Schedule 40 PVC  
MP Elevation: 30.22 ft bgs  
Surface Elevation: 30.55 ft bgs  
Northing: 223920.06  
Easting: 853498.86

#### GRAPHICAL REPRESENTATION



#### PIEZOMETER / WELL MATERIAL DESCRIPTIONS

**Well Riser:** Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

**Well Screen:** Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

**Bentonite Grout:** Cetco Super GelX Drilling Fluid and potable water mix.

**Bentonite Chips:** Cetco Medium Size Bentonite Chips.

**Filter Pack Sand:** Filpro Superior Quartz Filtration Media; Size #00N.

**Flush Mount Box:** Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

**Well Cap:** Geoprobe Systems, Inc.; locking well plug; 0.5-inch diameter.

#### LEGEND:

LOC ID: Location Identification      bgs: below ground surface  
MP: Measuring Point  
in: inches  
ft.: feet  
msl: mean sea level

#### INSTALLATION NOTES:

FIRST WATER: 5.5 ft. bgs  
REFUSAL: Not encountered.  
OTHER: First attempt at well installation on 4/21/05 was unsuccessful.

**LOC ID: 69MW1318A**

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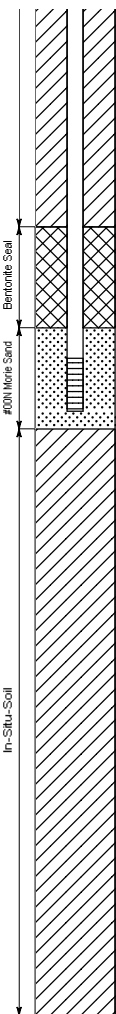


**LOC ID: 69MW1318A**

Project Name: FS-28								Location: Coonamessett River Bogs, Falmouth, MA							
Project Number: 35Q85007				Northing: 222810.31				Easting: 853275.86							
Drilling Contractor: DRAGIN DRILLING				Elevation ft (MSL): 27.03				Measuring Point: Top PVC							
Drilling Equipment: CME-95				Date Started: 11/24/98				Date Finished: 11/24/98							
Drilling Method: Hollow Stem Auger				Total Depth Drilled ft (BGS): 220.00				First Water ft (BGS): 4.0							
Sampling Method: Packer Pump				Borehole Diameter (in.): 8.00				Well Diameter (in.): 2.50							
Const. Materials SCH 80 PVC				Well Depth ft (BGS): 160.25				Static Water ft (BTOC): 2.10							
Logged by: J. Wood			Reviewed by: K. McCutcheon, CPG			Completion: Flushmount			Date Measured: 03/26/03						
Depth (ft-bgs)	Sample ID	Interval (ft.)	Headspace (ppm)	Purge Vol. (gal)	Purge Rate (gpm)	Temperature (c)	pH (units)	ORP (mV)	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Remarks	Well Construction Diagram	Elevation (ft msl)	
0	MM-F015701 MM-F015702	◀ ▶	0.0	25.0	3.3	13.25	6.85	164.2	159.0	8.33	41.7	YSI#11046, Equipment Blank	<div><div></div><div></div></div> <div>In-Situ Soil</div>	30	
5														25	
10	MM-F015703 MM-F015704	◀ ▶	0.0	25.0	9.0	12.21	5.52	203.4	98.0	5.22	43.1			20	
15														15	
20	MM-F015801 MM-F015802 MM-F015803 MM-F015804	◀ ▶	0.0	25.0	6.5	11.19	5.47	202.4	85.0	9.20	15.4	Field Duplicate		10	
25														5	
30														0	
35														-5	
40	MM-F015805 MM-F015806	◀ ▶	0.0	25.0	10.0	10.61	5.46	208.6	73.0	9.68	11.5			-10	
45														-15	
50	MM-F015901 MM-F015902	◀ ▶	0.0	25.0	10.7	10.77	5.59	205.1	65.0	7.61	6.0		-20		
55													-25		
60	MM-F015903 MM-F015904	◀ ▶	0.0	25.0	9.3	10.80	5.70	204.8	64.0	9.18	5.2		-30		
65													-35		
70	MM-F016001 MM-F016002	◀ ▶	0.0	25.0	9.3	10.88	5.85	209.0	62.0	9.05	1.8	MS/MSD	-40		
75													-45		
80	MM-F016003 MM-F016004	◀ ▶	0.0	25.0	9.0	11.0	5.89	207.0	63.0	9.02	5.3		-50		
85													-55		
90	MM-F016101 MM-F016102	◀ ▶	0.0	25.0	10.0	10.96	5.99	204.6	63.0	7.78	62.9		-60		
95													-65		
100	MM-F016103 MM-F016104	◀ ▶	0.0	25.0	9.0	11.05	6.09	199.5	62.0	7.37	9.4		-70		
105													-75		
110	MM-F016201 MM-F016202	◀ ▶	0.0	47.0	5.4	11.30	6.17	198.0	66.0	6.78	5.4		-80		
115													-85		
120	MM-F016301 MM-F016302	◀ ▶	0.0	36.0	0.8	11.65	7.99	127.0	117.0	7.34	61.9	YSI#11261, Field Duplicate	-90		

**LOC ID: 69MW1318A**

**FS-28**

Project Name: FS-28						Location: Coonamessett River Bogs, Falmouth, MA											
Project Number: 35Q85007						Northing: 222810.31						Easting: 853275.86					
Depth (ft-bgs)	Sample ID	Interval (ft.)	Headspace (ppm)	Purge Vol. (gal)	Purge Rate (gpm)	Temperature (c)	pH (units)	ORP (mV)	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Remarks	Well Construction Diagram	Elevation (ft msl)			
125	MM-F016303													-95			
130	MM-F016305 MM-F016306	◀ ▶	0.0	25.0	9.6	11.20	6.70	77.9	63.0	7.64	6.8	Equipment Blank		-100			
135	MM-F017401 MM-F017402	◀ ▶	0.0	25.0	9.6	11.17	6.55	141.3	63.0	7.45	16.5			-105			
140														-110			
145	MM-F017403 MM-F017404	◀ ▶	0.0	25.0	9.6	11.49	6.51	163.5	63.0	8.23	18.6			-115			
150														-120			
155	MM-F017501 MM-F017502	◀ ▶	0.0	25.0	10.0	11.49	6.50	174.9	64.0	8.61	9.4			-125			
160														-130			
165	MM-F017503 MM-F017504	◀ ▶	0.0	25.0	10.0	11.48	6.48	179.9	66.0	6.90	11.6			-135			
170														-140			
175	MM-F017601 MM-F017602	◀ ▶	0.0	25.0	10.0	11.35	6.49	192.0	69.0	6.94	12.0			-145			
180														-150			
185	MM-F017603 MM-F017604	◀ ▶	0.0	25.0	10.0	11.46	6.45	187.7	74.0	6.20	48.6			-155			
190														-160			
195	MM-F017701 MM-F017702	◀ ▶	0.0	25.0	10.0	11.39	6.43	189.2	85.0	5.52	27.0			-165			
200														-170			
205	MM-F017703 MM-F017704	◀ ▶	0.0	25.0	6.9	11.52	6.38	179.9	112.0	3.76	294.6	olive green		-175			
210														-180			
215		◀ ▶										No recovery (Till). Bottom of boring at 220 ft. bgs.	-185				
220													-190				
225												Notes: 1. Well Depth 160.25 ft. bgs 2. SCH 80 PVC 3. Screen length 5.00 feet 4. Screen Interval 155.00 - 160.00 ft. bgs 5. Slot Size 0.010 in. 6. PZ Screen Interval 2.00 - 7.00 ft. bgs  Printed on 04/10/03	-195				
230													-200				
235													-205				
240													-210				
245													-215				
250													-220				
255													-225				
													-230				

**FS-28 Borehole Groundwater Screening Results**  
**Sonic Location 69PZ0004A**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L
10/4/2005	A	20	25	22.5	-5.5	ND
10/4/2005	B	30	35	32.5	-15.5	ND
10/4/2005	C	40	45	42.5	-25.5	ND
10/4/2005	D	50	55	52.5	-35.5	ND
10/4/2005	E	60	65	62.5	-45.5	ND
10/4/2005	F	70	75	72.5	-55.5	ND
10/4/2005	G	80	85	82.5	-65.5	ND
10/4/2005	H	90	95	92.5	-75.5	ND
10/5/2005	I	100	105	102.5	-85.5	ND
10/5/2005	J	110	115	112.5	-95.5	ND
10/5/2005	K	120	125	122.5	-105.5	ND
10/5/2005	L	130	135	132.5	-115.5	ND
10/5/2005	M	140	145	142.5	-125.5	ND
10/6/2005	N	150	155	152.5	-135.5	ND
10/6/2005	O	160	165	162.5	-145.5	ND
10/6/2005	P	170	175	172.5	-155.5	ND
10/6/2005	Q	180	185	182.5	-165.5	ND
10/6/2005	R	190	195	192.5	-175.5	ND
10/7/2005	S	200	205	202.5	-185.5	ND
10/7/2005	T	210	215	212.5	-195.5	ND
10/7/2005	U	220	225	222.5	-205.5	ND
10/7/2005	V	230	235	232.5	-215.5	ND
10/7/2005	W	240	245	242.5	-225.5	ND
10/10/2005	X	250	255	252.5	-235.5	ND
10/10/2005	Y	260	265	262.5	-245.5	ND
10/10/2005	Z	270	275	272.5	-255.5	ND

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

**Notes:**

Approximate elevation of ground surface is 17 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

**Key:**

BOS = bottom of sample

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

ND = not detected

TOS = top of sample

µg/L = micrograms per liter





# WELL CONSTRUCTION DIAGRAM

LOCATION: 69PZ0004AB

FS-28 SPEIM

Project Name: FS-28 SPEIM

Location: FS-28 Leading Edge Investigation

Project Number: 187615

Northing A: 217544.95 B: 217544.73 Easting A: 853641.19 B: 853641.14 GS Elev: 17.49

Drilling Contractor: Boart Longyear Co.

MP Elevation (ft msl) A: 16.77

B: 16.74

Measuring Point: TOC

Drilling Equipment: #1509 GP24-300RS

Date Started: 10/4/2005

Date Finished: 10/12/2005

Drilling Method: Sonication

Sampling Method: Core Barrel/Sub Pump

Total Depth Drilled (ft bgs): 300

Const. Materials: SCH 80 PVC

Borehole Diameter (in.): 7.625

Well Diameter (in.): 2.5

Screen Slot Size (in) A: 0.01 B: 0.01

Well Depth (ft bgs) A: 176.75 B: 54.8

First Water (ft bgs): 3.5

Static Water (ft btoc): 2.5

Logged By: M. Greenberg

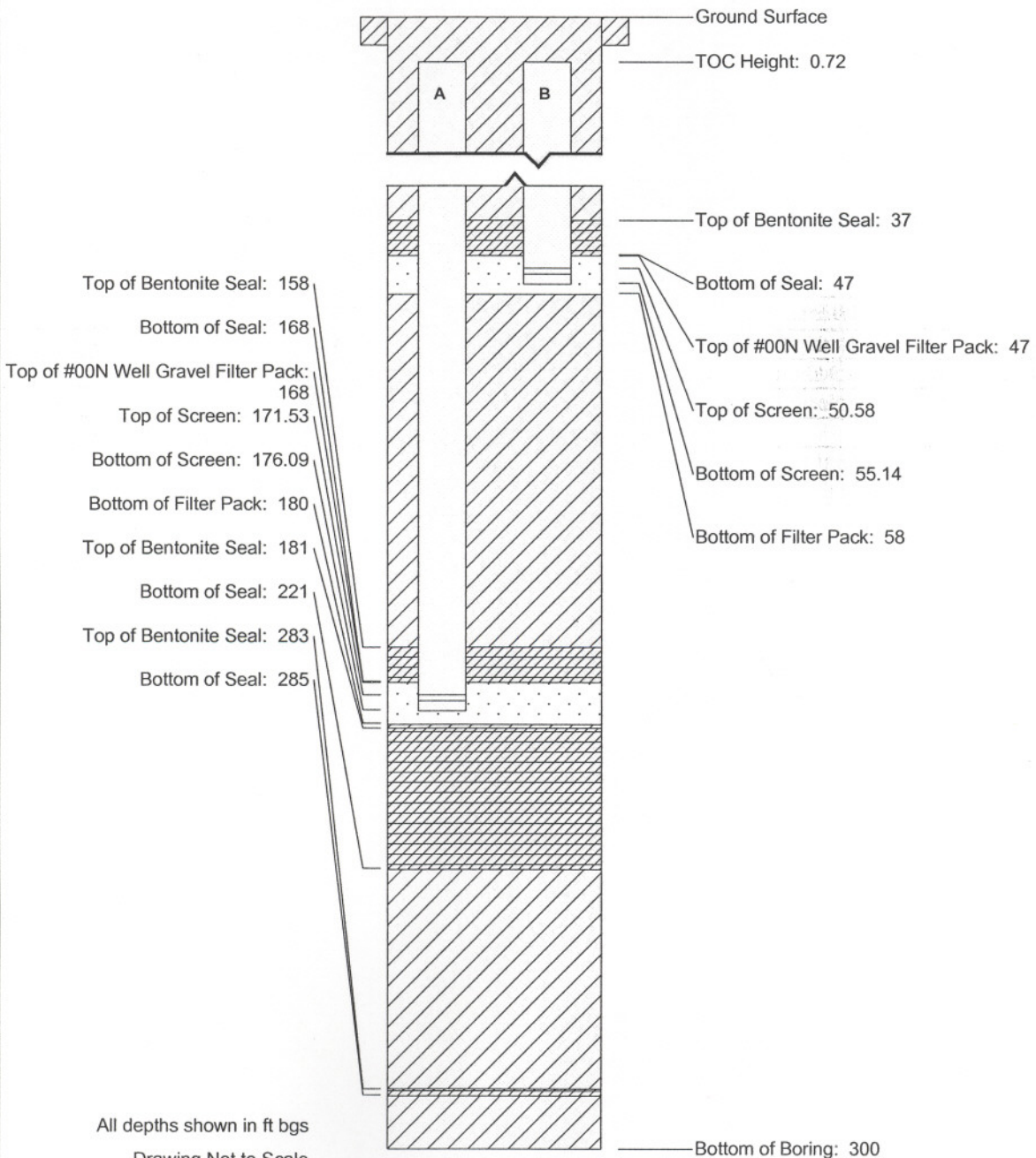
Reviewed By: CH2M Hill

Completion: Flush mount

Date Measured: 10/7/2005

LOCID: 69PZ0004A

LOCID: 69PZ0004B





**LOCATION: 69PZ0004AB**

Project Name: FS-28 SPEIM				Location: Adjacent to Pond 14			
Project Number: 187615	Northing A: 217544.95	B: 217544.73	Easting A: 853641.19	B: 853641.14	GS Elev: 17.49		
Drilling Contractor: Boart Longyear Co.		MP Elevation ft (MSL) A: 16.77		B: 16.74	Measuring Point: TOC		
Drilling Equipment: #1509 GP24-300RS		Date Started: 10/4/2005			Date Finished: 10/12/2005		
Drilling Method: Sonication		Total Depth Drilled ft (BGS): 300			First Water ft (BGS): 3.5		
Sampling Method: Core Barrel/Sub Pump		Borehole Diameter (in.): 7.625			Well Diameter (in.): 2.5		
Const. Materials: SCH 80 PVC		Well Depth ft (BGS) A: 176.75			B: 55.47		
Logged By: M. Greenberg		Reviewed By: CH2M Hill		Completion: Flush mount		Date Measured: 10/7/2005	

Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval / Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)
0			Soil logging starts at 3 feet.					
			0-4 feet: Gravely, cobbly fine to coarse sand, wet.					
5				0.4/0.4	SP	GRAVELLY SAND, 2.5Y 6/3 light yellowish brown, medium to coarse sand, subrounded fine to coarse gravel, trace silt, saturated.		15
				0.8/0.6	NSNR	SAND, 10YR 6/6 brownish yellow, medium grained, little coarse sand, trace silt, saturated.		
					SP	No recovery.		
10						SAND, 2.5Y 6/3 light yellowish brown, medium grained, some fine sand, trace to little coarse sand, trace subrounded fine to coarse gravel, trace silt, saturated.		10
					NSNR	No recovery.		5
15				1.2/1.1	SP	SAND, 2.5Y 6/3 light yellowish brown, medium grained, some fine sand, trace coarse sand, trace subrounded fine to coarse gravel, trace silt, saturated.		0
20	13							-5
25				1.2/1.1	SP	SAND, 7.5YR 4/6 strong brown, medium grained, some fine sand, trace coarse sand, trace fine gravel, trace silt, saturated, iron oxide color.		
					SP	SAND, 2.5Y 6/6 olive yellow, fine to medium grained, trace silt, trace coarse sand, saturated.		-10

Project Name: FS-28 SPEIM					Location: Adjacent to Pond 14			
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)
30	13.6				SM	SAND, 2.5Y 6/3 light yellowish brown, fine grained, little medium sand, trace coarse sand, trace silt, saturated.		
					NSNR	No recovery.		-15
35			35-55 ft.: Easy drilling conditions.		SP	SAND, 2.5Y 6/4 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, saturated.		-20
					SP	SAND, 2.5Y 7/3 pale yellow, medium grained, some fine sand, trace coarse sand, trace silt, saturated.		
40	13			1.1/1.4	SP	SAND, 2.5Y 7/3 pale yellow, medium grained, trace to little fine and coarse sand, trace rounded fine gravel, trace silt, saturated.		-25
					SP	SAND 2.5Y 5/6 light olive brown, medium grained, some fine sand, trace coarse sand, trace rounded fine gravel, trace silt, saturated.		
					NSNR	No recovery.		-30
45								
50	13.6							-35
55			55-75 ft.: Easy drilling conditions.	0.9/0.9	SP	SAND, 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, saturated.		-40
					SPSM	SAND, 2.5Y 5/3 light olive brown, fine grained, trace to little silt, trace medium sand, saturated.		
					SP	SAND, 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, saturated.		-45
60	13.6				SPSM	SAND, 2.5Y 5/3 light olive brown, fine grained, trace to little silt, trace medium sand, saturated.		
65								

Project Name: FS-28 SPEIM

Location: Adjacent to Pond 14

Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)
70	13.6				NSNR	No recovery.		-50
75				0.5/0.6	SP	SAND, 2.5Y 6/4 light yellowish brown, fine to medium grained, trace coarse sand, trace subrounded fine gravel, trace silt, saturated.		-55
80	13			1.8/0.9	SP	SAND, 2.5Y 6/3 light yellowish brown, fine grained, some medium sand, trace subrounded fine gravel, trace silt, trace coarse sand, saturated.		-60
85					NSNR	No recovery.		-65
90	13.6				SPSM	SAND, 2.5Y 6/3 light yellowish brown, fine grained, trace medium sand, trace to little silt, saturated, silt lens at 113.2-113.4 feet.		-70
95								-75
100	13			1.0/1.1				-80



Project Name: FS-28 SPEIM					Location: Adjacent to Pond 14			
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)
105								-85
110	8.6			0.0/0.2				-90
115			115-135 ft.: Drilling conditions were easy.	1.1/1.2	SPSM	SAND, 5Y 5/2 olive gray, fine grained, little medium sand, trace to little silt, saturated.		-95
120	8.6							-100
125			CHPK0004A00105		ML	SILT, 5Y 5/2 olive gray, trace to little fine sand, trace clay, saturated.		-105
130	3			0.6/0.6	ML	SILT, 5Y 5/2 olive gray, little fine sand, trace clay, saturated.		-110
135			CHPK0004B00105		NSNR	No recovery.		-115
			135-155 ft.: Recovered sample expanded in core barrel, resulting in an actual recovery of 21.2 feet.		ML	SILT, 5Y 5/2 olive gray, little fine sand, saturated.		-120

Project Name: FS-28 SPEIM					Location: Adjacent to Pond 14				
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)	
140	0.94							-125	
145								-130	
150	1.9		CHPK0004C00105	0.2/0.3	ML	SILT, 5Y 5/2 olive gray, trace to little fine sand, trace to little clay, saturated.		-135	
155			155-175 ft.: Drilling conditions were easy.	0.3/0.2	SP	SAND, 5Y 5/2 olive gray, fine grained, trace silt.		-140	
160	0.9		CHPK0004D00105	0.4/0.4	ML SP	SILT, 5Y 5/2 olive gray, trace to little fine sand, trace to little clay, saturated. SAND, 2.5Y 5/2 grayish brown, fine grained, trace to little medium sand, trace silt, saturated.		-145	
165			CHPK0004E00105	0.4/0.5	ML	SILT, 5Y 5/1 gray, some clay, trace fine sand, saturated.		-150	
170	5.8				SPSM	SAND, 5Y 5/1 gray, fine grained, trace to little silt, trace medium sand, saturated, trace iron oxide color (10YR 5/6 yellowish brown).		-155	
175			175-195 ft.: Actual recovered length was 20.3 feet due to		SP	SAND, 2.5Y 6/3 light yellowish brown, fine to medium grained, trace silt, saturated.		-160	
					NSNR	No recovery.		-165	
								-170	

Project Name: FS-28 SPEIM					Location: Adjacent to Pond 14			
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval / Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)
			expansion of silt intervals.			medium grained, trace silt, saturated.		
			CHPK0004F00105	1.4/1.4	SM	SILTY SAND, 5Y 4/2 olive gray, fine grained, saturated.		-160
180	10							
			CHPK0004G00105		ML	SILT, 5Y 4/2 olive gray, little clay, trace to little fine sand, trace medium and coarse sand, saturated.		-165
185								-170
								-175
190	3.7							
				1.2/1.2	SP	SAND, 5Y 5/2 olive gray, fine grained, trace silt, saturated.		
195					ML			
					SP	SILT, 5Y 5/2 olive gray, trace clay, moist, medium stiff.		
				0.4/0.0	SM	SAND, 2.5Y 5/4 light olive brown, fine to medium grained, trace coarse sand, trace silt, saturated.		-180
			CHPK0004H00105		ML			
200	7.9				SP	SAND, 2.5Y 6/6 olive yellow, fine grained, little silt, saturated.		
						SILT, 5Y 5/2 olive gray, trace fine sand, saturated.		
						SAND, 5Y 5/1 gray, trace silt, fine to medium grained, trace coarse sand, trace rounded fine to coarse gravel, saturated.		-185
205								
				0.5/1.1	SM	SAND, 5Y 5/3 olive, fine grained, some silt, trace medium sand, wet.		-190
210	5.4		CHPK0004I00105					
					SM	SAND, 5Y 5/3 olive, coarse grained, little fine to medium sand, little silt, little subangular to subrounded fine to coarse gravel, wet.		-195






Project Name:FS-28 SPEIM					Location: Adjacent to Pond 14				
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol		Well Construction Diagram	Elevation (ft msl)
215	9.7		CHPK0004J00105	7.4/11.4	NSNR	No recovery.			-200
220					SM	SAND, 5Y 4/2 olive gray, medium grained, little silt, some fine and coarse sand, some subangular to subrounded fine to coarse gravel, saturated.			
225	12.5		CHPK0004K00105	7.1/7.0	SM	SAND, 5Y 5/2 olive gray, fine to medium grained, little silt, little subrounded to subangular fine to coarse gravel, trace coarse sand, wet.			-210
230					NSNR	No recovery.			
235	12		CHPK0004L00105	1.9/1.8	SP	SAND, 2.5Y 5/2 grayish brown, medium grained, little coarse sand, trace fine sand, trace silt, trace subrounded fine to coarse gravel, saturated.			-220
240					SM	SAND, 5Y 4/2 olive gray, medium grained, some fine and coarse sand, some subangular to subrounded fine to coarse gravel, little silt, saturated.			
245					ML	SILT, 5Y 4/2 olive gray, little fine to coarse sand, trace to little subangular gravel, wet, dense.			
				3.0/2.4					-230



Project Name: FS-28 SPEIM					Location: Adjacent to Pond 14				
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)	
250	6.1		Material becomes somewhat harder at 250 feet.						
					NACM	ROCK, weathered, dry, interbedded with silt.		-235	
					NSNR	No recovery.			
255			255-265 ft.: Core barrel advanced using water, since bedrock was anticipated at the start of the core. Much of the retrieved sample was washed out, leaving only gravel.		NSNR	GRAVEL, subrounded fine to coarse grained, saturated (only 2.6 feet recovered).		-240	
260	13.6							-245	
265			CHPK0004M00105	3.0/2.5	GM	GRAVEL, 5Y 5/1 gray, subrounded to subangular fine to coarse grained, little silt, little fine, medium and coarse sand, saturated.		-250	
270	13.6							-255	
			CHPK0004N00105		ML	GRAVELLY SILT, GLEY1 5/10Y greenish gray, subrounded fine to coarse gravel, some fine, medium, and coarse sand, dry.		-260	
275			275-295 ft.: Core barrel was advanced through interval twice resulting in a ground-up sample. Driller reported material possibly feeling like rock from approximately 280 feet. Top of core sample is very disturbed and not logged.		NSNR	No undisturbed recovery.		-265	
280									
285					GM	GRAVEL, 5Y 5/1 gray, subrounded to subangular fine to coarse grained, little silt,			

Project Name:FS-28 SPEIM					Location: Adjacent to Pond 14				
Depth (ft-bgs)	Purge Rate (gpm)	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	Well Construction Diagram	Elevation (ft msl)	
290			CHPK0004O00105			trace fine to coarse sand, saturated.		-270	
				CL		GRAVELLY CLAY, GLEY 5/10G greenish grey, subrounded fine to coarse gravel, little fine, medium, and coarse sand, wet.		-275	
295				NACM	x x x x x x x x x	ROCK, pink granite, gravel to cobble size, subangular to angular.			
				NSNR		No recovery.		-280	
300						Notes: 1. Well Depth 69PZ0004B: 55.47 ft. bgs 69PZ0004A: 176.75 ft. bgs 2. SCH 80 PVC Screens 3. Screen length 69PZ0004B: 4.56 feet 69PZ0004A: 4.56 feet 4. Screen Interval 69PZ0004B: 50.58 - 55.14 ft. bgs 69PZ0004A: 171.53 - 176.09 ft. bgs 5. Slot Size: 0.01 in.  Printed on 4/19/2006		-285	
305								-290	
310									



LOCATION:69PZ0004AB

Well  
Construction  
Diagram





Project Name: FS-28 SPEIM

Location: Adjacent to Pond 14

Depth (ft-bgs)	Sample ID	Interval (ft)	Headspace (ppm)	Purge vol (gal)	Purge Rate (gpm)	Temperature (c)	pH (units)	ORP (mV)	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Remarks	Well Construction Diagram	Elevation (ft msl)
80	CHPK00004G00105	◀ ▶		294	13	13.15	5.96	30.8	91	0.49	2.2			-60
85														-65
90	CHPK00004H00105	◀ ▶		201	13.6	13.01	6.06	46.4	88	0.63	10.4	Initial purge is light yellow brown, cloudy. It clears fairly quickly.		-70
95														-75
100	CHPK00004I00105	◀ ▶		294	13	12.14	6.71	-65.2	89	0.32	47.4	Initial purge is silty with light yellowish brown color.		-80
105														-85
110	CHPK00004J00105	◀ ▶		221	8.6	12.54	6.74	-53.5	97	0.45	226.5	Initial purge is gray and silty with trace fine sand.		-90
115														-95
120	CHPK00004K00105	◀ ▶		246	8.6	13.6	6.92	-106.1	101	0.76	425	Initial purge is olive-gray silty with trace fine sand.		-100
125														-105
130	CHPK00004L00105	◀ ▶		209	3	14.43	7.16	-122.7	113	2.35	59.4	Initial purge is olive-gray and silty with trace very fine sand. Flow rate increases from 1.6 gpm but pulses at average rate of 3.0 gpm.		-110
135														-115
140	CHPK00004M00105	◀ ▶		203	0.94	18.82	7.31	-109.4	138	3.48	75.7	Purge is olive gray and silty with trace fine sand present. Flow rate pulses and decreases from 1.1 to 0.94 gpm.		-120
145														-125
150	CHPK00004N00105	◀ ▶		179	1.9	15.14	7.25	-45.5	117	0.22	592.2	Initial purge is olive gray and very silty with trace fine sand. The flow rate pulses through purge.		-130
155														-135
160	CHPK00004O00105	◀ ▶		50	0.9	18.59	7.2	-29	143	4.32	1339.4	Initial purge is little sandy, silty with gray color. It becomes sandier then silty. Purge volume is shorter than intended minimum purge due to very low flow rate.		-140
165														-145
170	CHPK00004P00105	◀ ▶		217	5.8	14.31	6.83	134.5	74	0.79	11			-150



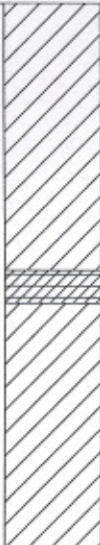



LOCATION: 69PZ0004AB

FS-28 SPEIM

Project Name:FS-28 SPEIM

Location: Adjacent to Pond 14

Depth (ft-bgs)	Sample ID	Interval (ft)	Headspace (ppm)	Purge vol (gal)	Purge Rate (gpm)	Temperature (c)	pH (units)	ORP (mV)	Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Remarks	Well Construction Diagram	Elevation (ft msl)
270	CHPK00004Z00105	◀ ▶		406	13.6	12.71	7.32	-128.8	115	5.29	1966.6	Initial purge is gray, very silty, trace sandy. It remains very silty.		-250
275														-255
280														-260
285														-265
290														-270
295														-275
300														-280
305												Notes: 1. Well Depth 69PZ0004B: 55.47 ft. bgs 69PZ0004A: 176.75 ft. bgs 2. SCH 80 PVC Screens 3. Screen length 69PZ0004B: 4.56 feet 69PZ0004A: 4.56 feet 4. Screen Interval 69PZ0004B: 50.58 - 55.14 ft. bgs 69PZ0004A: 171.53 - 176.09 ft. bgs 5. Slot Size: 0.01 in.		-285
310														-290
315														-295
320														-300
325												Printed on 4/19/2008		-305





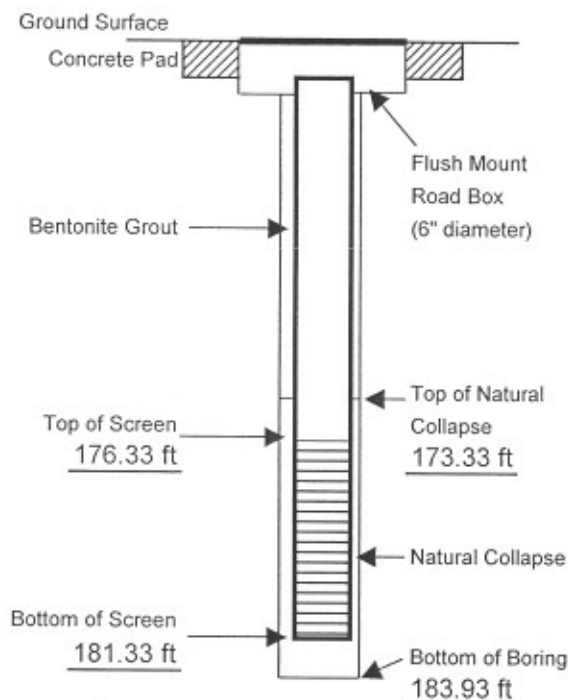
CH2MHILL

## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0005A
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	183.93 ft bgs
Date Started:	31-Oct-05	Total Well Depth:	181.33 ft bgs
Date Completed:	1-Nov-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	25.71 ft msl
Rig Operator:	T.O'Connell/T. Irvine	Surface Elevation:	25.87 ft msl
Borehole Diameter (In):	2.1	Northing:	220068.7
Well Diameter (In):	0.5	Easting:	853419.7

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

Well Cap: Geoprobe Systems, Inc.

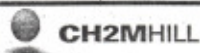
### LEGEND:

LOC ID: Location Identification  
 MP: Measuring Point  
 in: inches  
 ft: feet  
 msl: mean sea level

### INSTALLATION NOTES:

FIRST WATER: 5.85 ft  
 REFUSAL: not encountered  
 OTHER:



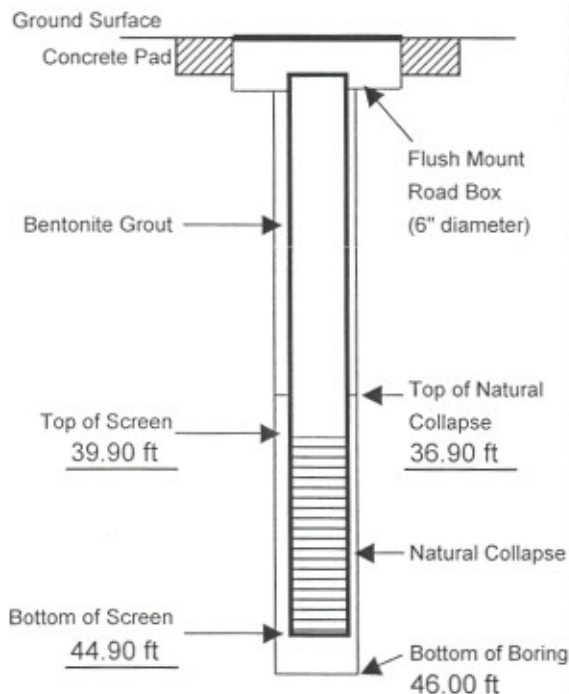


## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0005B
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	46.00 ft bgs
Date Started:	28-Oct-05	Total Well Depth:	44.90 ft bgs
Date Completed:	28-Oct-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	25.78 ft msl
Rig Operator:	T.O'Connell/T. Irvine	Surface Elevation:	25.96 ft msl
Borehole Diameter (In):	2.1	Northing:	220066.3
Well Diameter (In):	0.5	Easting:	853420.2

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

Well Cap: Geoprobe Systems, Inc.

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

FIRST WATER: 5.91 ft  
REFUSAL: not encountered  
OTHER:

**FS-28 Borehole Groundwater Screening Results**  
**Direct Push Location 69PZ0006A**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Date Sampled	Sample	TOS Depth (ft bgs)	BOS Depth (ft bgs)	Mid-Depth (ft bgs)	Mid-Depth (ft msl)	EDB (µg/L) MMCL = 0.02 µg/L	Purge Water
N/A	A	15	22	18.5	19.5	NA	light olive brown clearing to grey trace fine sand
N/A	B	25	32	28.5	9.5	NA	light olive brown clearing to grey trace fine sand
N/A	C	35	42	38.5	-0.5	NA	light olive brown clearing to grey trace fine sand
N/A	D	45	52	48.5	-10.5	NA	olive yellow cloudy, trace fine sand
N/A	E	55	62	58.5	-20.5	NA	olive brown, abundant fine sand
N/A	F	65	72	68.5	-30.5	NA	grey/green, trace fine sand
5/13/2005	G	75	82	78.5	-40.5	ND	greenish grey with fine sands
5/13/2005	H	85	92	88.5	-50.5	ND	pale greyish brown little fine sand
5/13/2005	I	95	102	98.5	-60.5	ND	greenish grey, abundant fine sands, becoming brown
5/13/2005	J	105	112	108.5	-70.5	ND	pale yellow brown
5/13/2005	K	115	122	118.5	-80.5	ND	light olive brown
5/13/2005	L	125	132	128.5	-90.5	ND	olive brown clearing
5/13/2005	M	135	142	138.5	-100.5	ND	olive brown
5/13/2005	N	145	152	148.5	-110.5	ND	olive grey

Data Source: AFCEE, January 2006, MMR-AFCEE Data Warehouse

Notes:

Approximate elevation of ground surface is 38 ft msl.

All samples were analyzed by Groundwater Analytical at the on-site lab.

69PZ0006A installed adjacent to direct push location 69DP1006

Key:

BOS = bottom of sample

EDB = ethylene dibromide

ft bgs = feet below ground surface

ft msl = feet mean sea level

MMCL = Massachusetts Maximum Contaminant Level

NA = groundwater sample not collected for EDB analysis

N/A = not applicable

ND = not detected

TOS = top of sample

µg/L = micrograms per liter



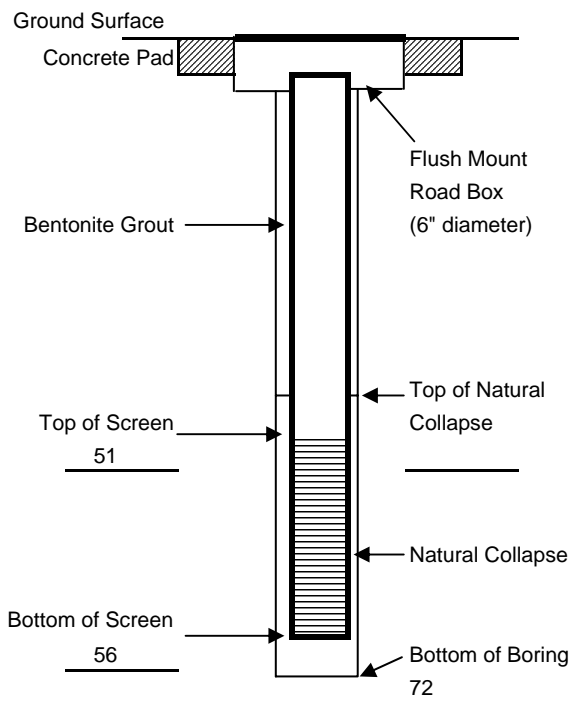
## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

**Project Name:** FS-28  
**Project Number:** 324146-SPEIM-FS28  
**Date Started:** 10-May-05  
**Date Completed:** 11-May-05  
**Rig Type:** Geoprobe 6620DT  
**Rig Operator:** M. Gifford / T. Irvine  
**Borehole Diameter (In):** 2.125  
**Well Diameter (In):** 0.5

**LOC ID:** 69PZ0006B  
**Total Borehole Depth:** ~72 ft. bgs  
**Total Well Depth:** ~56 ft. bgs  
**Construction Materials:** Schedule 40 PVC  
**MP Elevation (estimated):** 37  
**Surface Elevation (estimated):** 37  
**Northing (estimated):** 220666  
**Easting (estimated):** 851896

#### GRAPHICAL REPRESENTATION



#### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

**Well Riser:** Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

**Well Screen:** Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

**Bentonite Grout:** Cetco Super GelX Drilling Fluid and potable water mix.

**Flush Mount Box:** Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

**Well Cap:** Geoprobe Systems, Inc.; locking well plug; 0.5-inch diameter.

**THIS IS A DRAFT DOCUMENT.  
FINAL MEASUREMENTS AND SURVEY NOT COMPLETED YET.**

#### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

#### INSTALLATION NOTES:

**FIRST WATER:** 13 ft. bgs  
**REFUSAL:** Not encountered.  
**OTHER:**



# WELL CONSTRUCTION DIAGRAM

LOCATION: 69PZ0012AB

FS-28 SPEIM

Project Name: FS-28 SPEIM

Location: INSTALLED WITH 69MW0012A

Project Number: 324146

Northing A: 222810.72

B: 222810.72

Easting A: 852340.29

B: 852340.54

GS Elev: 33.18

Drilling Contractor: Boart Longyear Co.

MP Elevation (ft msl) A: 32.72

B: 32.75

Measuring Point: TOC

Drilling Equipment: #1512 GP24-300RS

Date Started: 7/18/2005

Date Finished: 7/26/2005

Drilling Method: Sonication

Sampling Method: Core Barrel/Sub Pump

Total Depth Drilled (ft bgs): 253

Const. Materials: Sch 40 PVC

Borehole Diameter (in.): 7.625

Well Diameter (in.): 2.5

Screen Slot Size (in) A: 0.01

B: 0.01

Well Depth (ft bgs) A: 230.76

B: 54.64

First Water (ft bgs): 12.0

Static Water (ft btoc): 7.97

Logged By: M. Greenberg

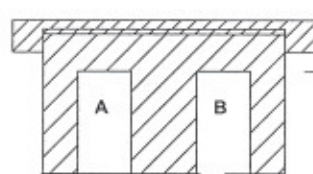
Reviewed By: CH2M HILL

Completion: Flush mount

Date Measured: 7/19/2005

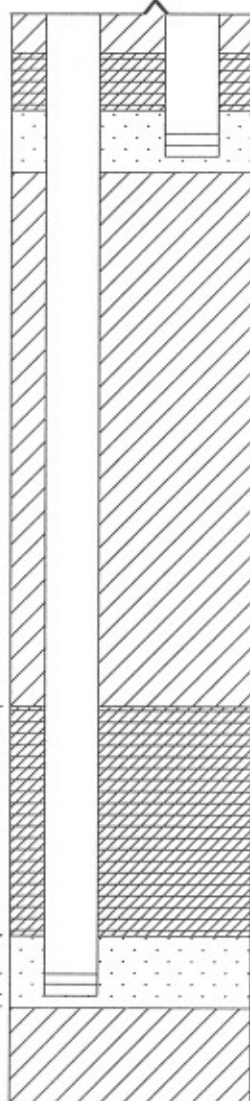
LOCID: 69PZ0012A

LOCID: 69PZ0012B



Ground Surface

TOC Height: 0.46



Top of Bentonite Seal: 33

Bottom of Seal: 45

Top of #00N Well Gravel Filter Pack: 45

Top of Screen: 49.91

Bottom of Screen: 54.64

Bottom of Filter Pack: 58

Top of Bentonite Seal: 170

Bottom of Seal: 218

Top of #00N Well Gravel Filter Pack: 218

Top of Screen: 225.92

Bottom of Screen: 230.48

Bottom of Filter Pack: 233

All depths shown in ft bgs

Drawing Not to Scale

Bottom of Boring: 253

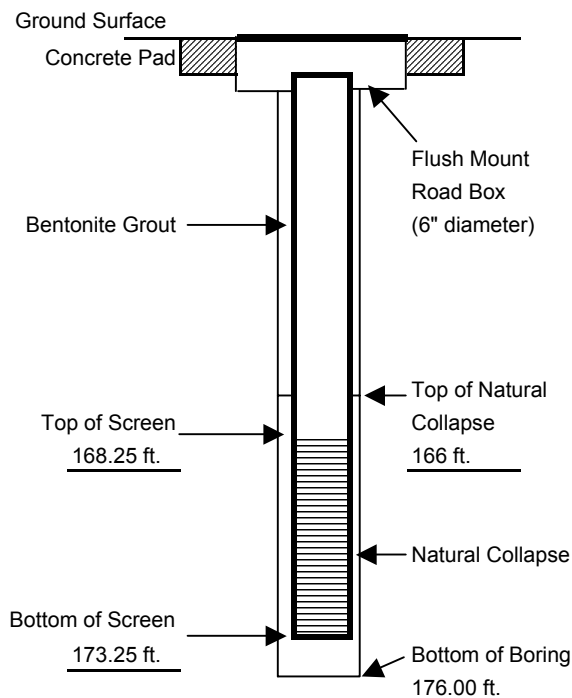


## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0013A
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	176 ft. bgs
Date Started:	26-May-05	Total Well Depth:	173.25 ft. bgs
Date Completed:	27-May-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	36.94 ft bgs
Rig Operator:	M. Gifford / T. Irvine	Surface Elevation:	37.36 ft bgs
Borehole Diameter (In):	2.125	Northing:	224699.08
Well Diameter (In):	0.5	Easting:	849859.56

#### GRAPHICAL REPRESENTATION



#### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

*Well Riser:* Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

*Well Screen:* Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

*Bentonite Grout:* Cetco Super GelX Drilling Fluid and potable water mix.

*Flush Mount Box:* Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

*Well Cap:* Geoprobe Systems, Inc.; locking well plug; 0.5-inch diameter.

#### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

#### INSTALLATION NOTES:

FIRST WATER: Not measured.  
REFUSAL: Not encountered.  
OTHER: \_\_\_\_\_



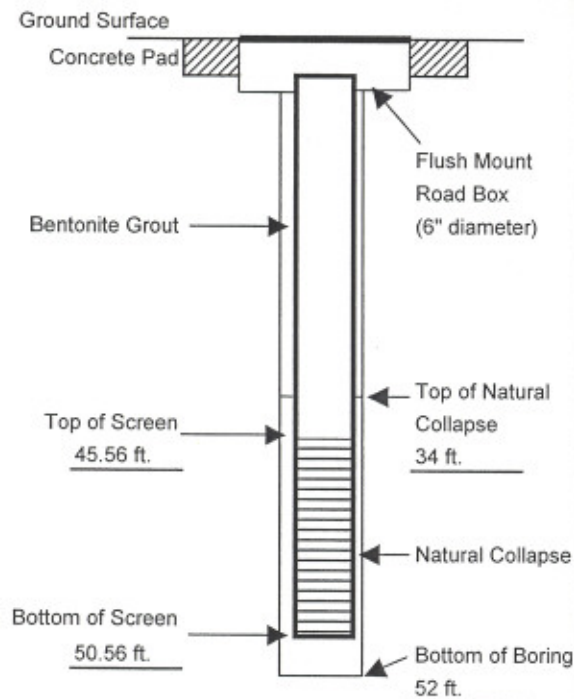


## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0013B
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	52 ft. bgs
Date Started:	25-May-05	Total Well Depth:	50.56 ft. bgs
Date Completed:	25-May-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	37.25 ft bgs
Rig Operator:	M. Gifford / T. Irvine	Surface Elevation:	37.70 ft bgs
Borehole Diameter (In):	2.125	Northing:	224698.44
Well Diameter (In):	0.5	Easting:	849864.52

#### GRAPHICAL REPRESENTATION



#### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

*Well Riser:* Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

*Well Screen:* Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

*Bentonite Grout:* Cetco Super GelX Drilling Fluid and potable water mix.

*Flush Mount Box:* Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

*Well Cap:* Geoprobe Systems, Inc.; locking well plug; 0.5-inch diameter.

#### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

#### INSTALLATION NOTES:

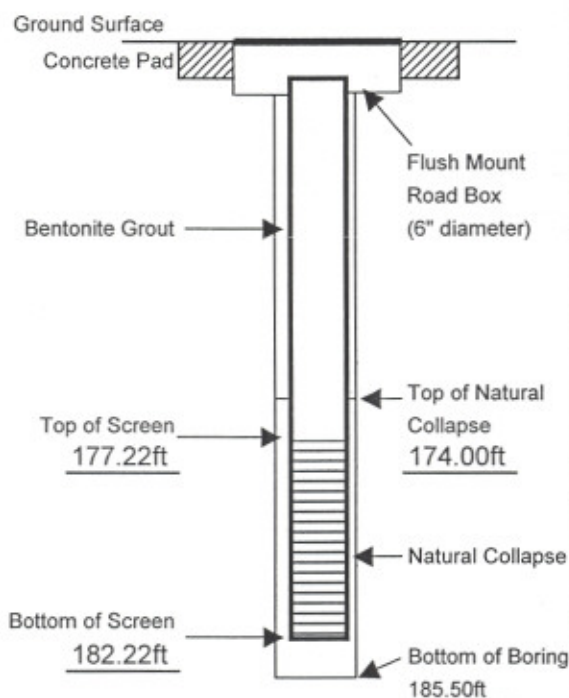
FIRST WATER: Not measured.  
REFUSAL: Not encountered.  
OTHER:



## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0017A
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	185.50ft bgs
Date Started:	21-Jul-05	Total Well Depth:	182.20ft ftoc
Date Completed:	22-Jul-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	45.6 ft MSL
Rig Operator:	M. Gifford / T. Irvine	Surface Elevation:	45.92 ft MSL
Borehole Diameter (In):	2.125	Northing:	220735.68
Well Diameter (In):	0.5	Easting:	853017.64

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

Well Cap: Geoprobe Systems, Inc.;

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

FIRST WATER: 24.72ft  
REFUSAL: Not encountered.  
OTHER:



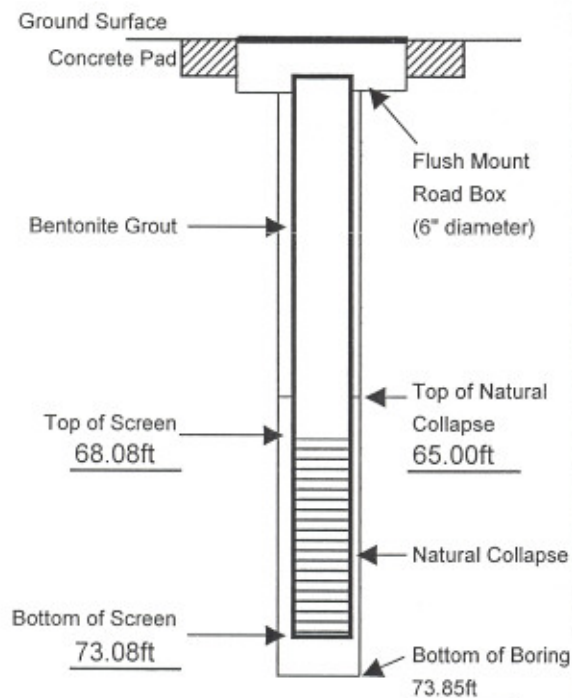


CH2MHILL

## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG PIEZOMETER/WELL INSTALLATION DIAGRAM

<b>Project Name:</b> FS-28 <b>Project Number:</b> 324146-SPEIM-FS28 <b>Date Started:</b> 25-Jul-05 <b>Date Completed:</b> 8/18/2005 <b>Rig Type:</b> Geoprobe 6620DT <b>Rig Operator:</b> M. Gifford / T. Irvine <b>Borehole Diameter (In):</b> 2.125 <b>Well Diameter (In):</b> 0.5	<b>LOC ID:</b> 69PZ0017B <b>Total Borehole Depth:</b> 73.85ft bgs <b>Total Well Depth:</b> 73.08ft bgs <b>Construction Materials:</b> Schedule 40 PVC <b>MP Elevation:</b> 45.45 ft MSL <b>Surface Elevation:</b> 45.71 ft MSL <b>Northing:</b> 220732.83 <b>Easting:</b> 853015.01
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### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

**Well Riser:** Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

**Well Screen:** Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

**Bentonite Grout:** Cetco Super GelX Drilling Fluid and potable water mix.

**Flush Mount Box:** Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

**Well Cap:** Geoprobe Systems, Inc.;

### LEGEND:

LOC ID: Location Identification  
 MP: Measuring Point  
 in: inches  
 ft: feet  
 msl: mean sea level

### INSTALLATION NOTES:

**FIRST WATER:** 23.30ft  
**REFUSAL:** Not encountered.  
**OTHER:**



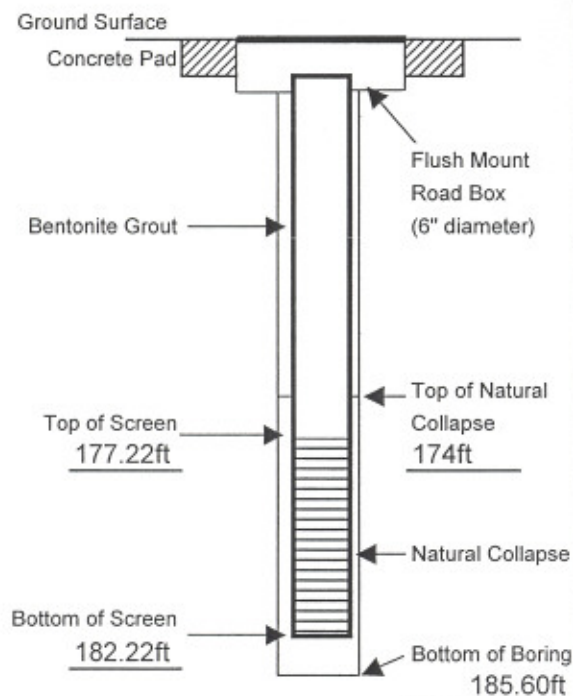
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## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

<b>Project Name:</b> FS-28 <b>Project Number:</b> 324146-SPEIM-FS28 <b>Date Started:</b> 19-Jul-05 <b>Date Completed:</b> 20-Jul-05 <b>Rig Type:</b> Geoprobe 6620DT <b>Rig Operator:</b> M. Gifford / T. Irvine <b>Borehole Diameter (In):</b> 2.1 <b>Well Diameter (In):</b> 0.5	<b>LOC ID:</b> 69PZ0018A <b>Total Borehole Depth:</b> 185.60ft bgs <b>Total Well Depth:</b> 182.22ft ftoc <b>Construction Materials:</b> Schedule 40PVC <b>MP Elevation:</b> 32.16 ft MSL <b>Surface Elevation:</b> 32.41 ft MSL <b>Northing:</b> 220830.32 <b>Easting:</b> 852604.72
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### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

**Well Riser:** Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

**Well Screen:** Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

**Bentonite Grout:** Cetco Super GelX Drilling Fluid and potable water mix.

**Flush Mount Box:** Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

**Well Cap:** Geoprobe Systems, Inc.; locking well plug; 0.5-inch diameter.

### LEGEND:

LOC ID: Location Identification  
 MP: Measuring Point  
 in: inches  
 ft: feet  
 msl: mean sea level

### INSTALLATION NOTES:

FIRST WATER: 10.81ft  
 REFUSAL: Not encountered.  
 OTHER: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



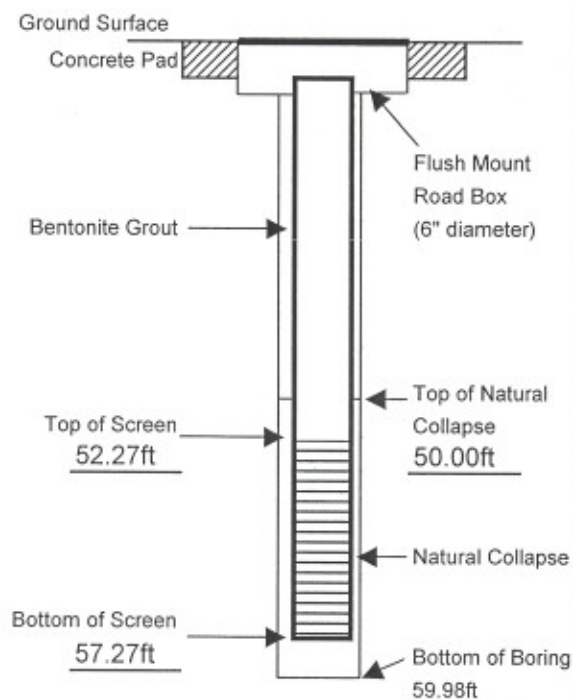
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## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

<b>Project Name:</b> FS-28 <b>Project Number:</b> 324146-SPEIM-FS28 <b>Date Started:</b> 13-Jul-05 <b>Date Completed:</b> 14-Jul-05 <b>Rig Type:</b> Geoprobe 6620DT <b>Rig Operator:</b> M. Gifford / T. Irvine <b>Borehole Diameter (In):</b> 2.125 <b>Well Diameter (In):</b> 0.5	<b>LOC ID:</b> 69PZ0018B <b>Total Borehole Depth:</b> 59.98ft bgs <b>Total Well Depth:</b> 57.27ft ftoc <b>Construction Materials:</b> Schedule 40 PVC <b>MP Elevation:</b> 31.83 ft MSL <b>Surface Elevation:</b> 32.27 ft MSL <b>Northing:</b> 220826.07 <b>Easting:</b> 852601.77
---	---

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

**Well Riser:** Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

**Well Screen:** Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

**Bentonite Grout:** Cetco Super GelX Drilling Fluid and potable water mix.

**Flush Mount Box:** Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

**Well Cap:** Geoprobe Systems, Inc.;

### LEGEND:

LOC ID: Location Identification  
 MP: Measuring Point  
 in: inches  
 ft: feet  
 msl: mean sea level

### INSTALLATION NOTES:

**FIRST WATER:** 10.90ft

**REFUSAL:** Not encountered.

**OTHER:**

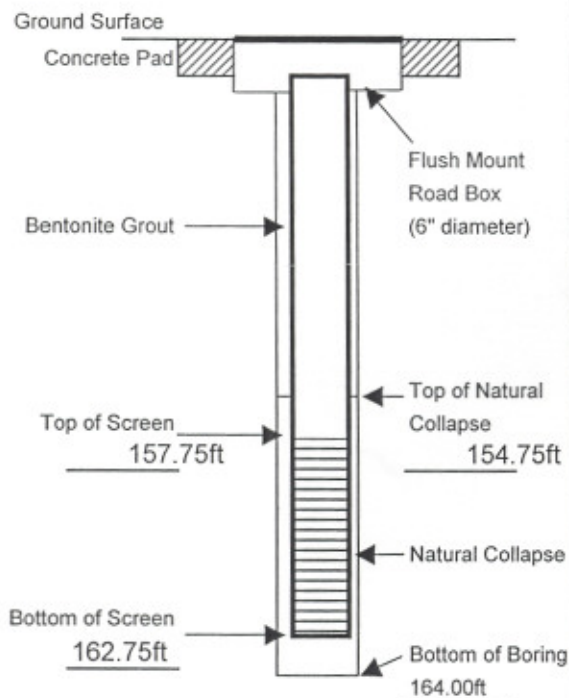




## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0019A
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	164.00ft bgs
Date Started:	23-Aug-05	Total Well Depth:	162.75ft floc
Date Completed:	31-Aug-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	27.74 ft MSL
Rig Operator:	M. Gifford / T. Irvine	Surface Elevation:	27.96 ft MSL
Borehole Diameter (In):	2.1	Northing:	220935.44
Well Diameter (In):	0.5	Easting:	853448.7

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

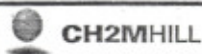
Well Riser:	Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.
Well Screen:	Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.
Bentonite Grout:	Cetco Super GelX Drilling Fluid and potable water mix.
Flush Mount Box:	Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.
Well Cap:	Geoprobe Systems, Inc.

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

FIRST WATER: 23.0 ft bgs  
REFUSAL: Not encountered  
OTHER:

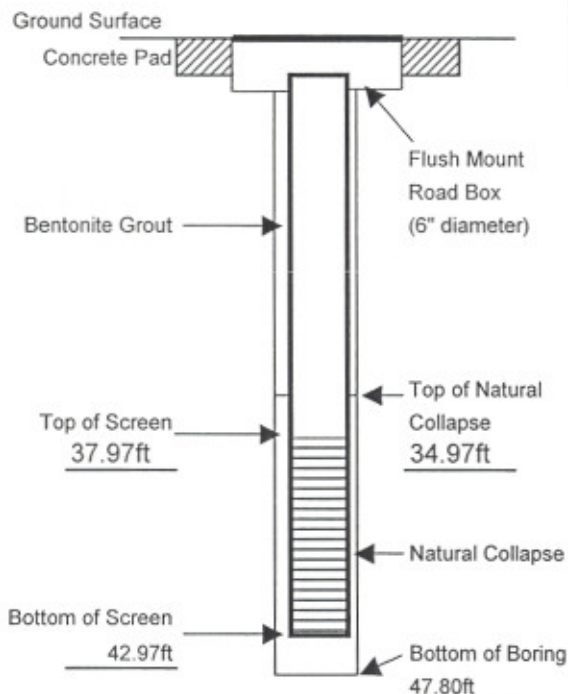


## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0019B
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	47.80ft bgs
Date Started:	24-Aug-05	Total Well Depth:	42.97ft ftoc
Date Completed:	30-Aug-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	27.46 ft MSL
Rig Operator:	M. Gifford / T. Irvine	Surface Elevation:	27.74 ft MSL
Borehole Diameter (In):	2.1	Northing:	220933.23
Well Diameter (In):	0.5	Easting:	853452.2

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

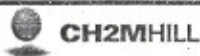
Well Cap: Geoprobe Systems, Inc.

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

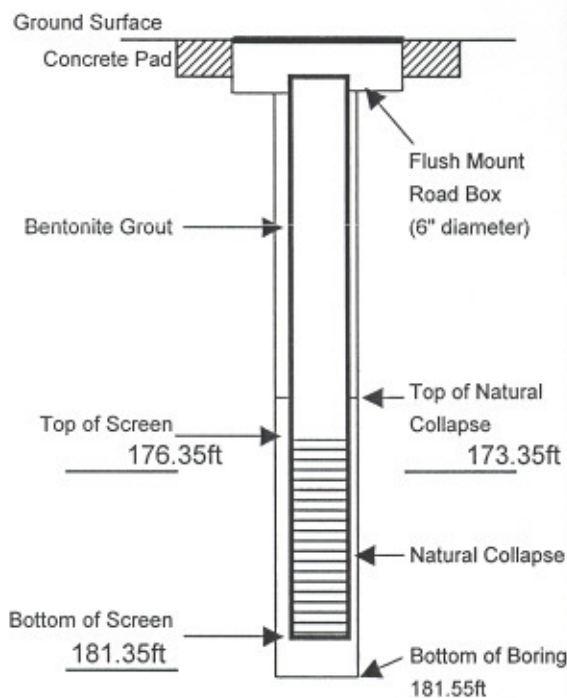
FIRST WATER: 23.0 ft bgs  
REFUSAL: Noe encountered  
OTHER:



## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0020A
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	181.55ft bgs
Date Started:	3-Oct-05	Total Well Depth:	181.35ft floc
Date Completed:	3-Oct-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	63.44 ft MSL
Rig Operator:	T.O'Connell/T. Irvine	Surface Elevation:	63.63 ft MSL
Borehole Diameter (In):	2.1	Northing:	220236.6
Well Diameter (In):	0.5	Easting:	852805.2

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

Well Cap: Geoprobe Systems, Inc.

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

FIRST WATER: 44.60ft

REFUSAL: 220.00ft

OTHER:

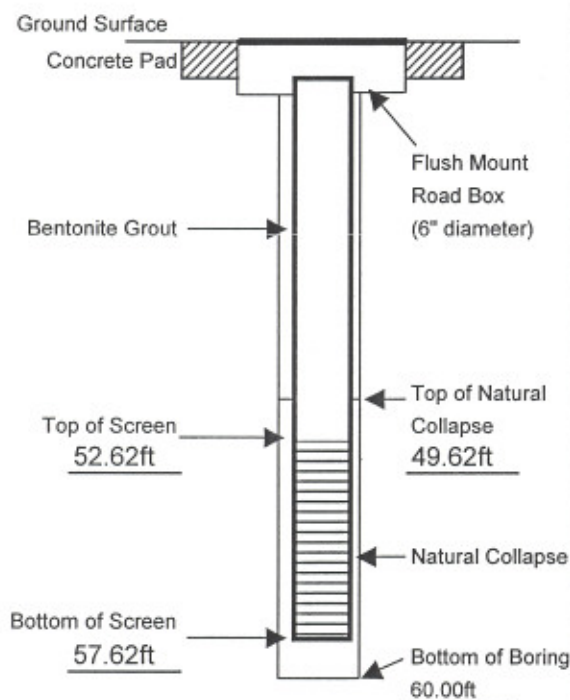




## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0020B
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	60.00ft bgs
Date Started:	5-Oct-05	Total Well Depth:	57.62ft floc
Date Completed:	5-Oct-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	63.35 ft MSL
Rig Operator:	T.O'Connell/T. Irvine	Surface Elevation:	63.55 ft MSL
Borehole Diameter (In):	2.1	Northing:	220233.4
Well Diameter (In):	0.5	Easting:	852803.9

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

Well Cap: Geoprobe Systems, Inc.

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

FIRST WATER: 42.87ft  
REFUSAL: 57.62ft  
OTHER:

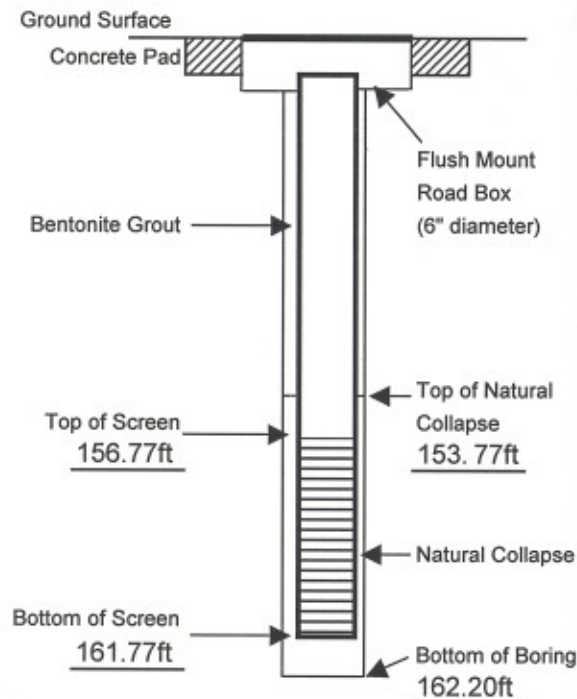


## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69P Z00 21A
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	162.20ft bgs
Date Started:	17-Oct-05	Total Well Depth:	161.77ft TOC
Date Completed:	20-Oct-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	34.13 ft msl
Rig Operator:	T.O'Connell/T. Irvine	Surface Elevation:	34.36 ft msl
Borehole Diameter (In):	2.1	Northing:	220251.2
Well Diameter (In):	0.5	Easting:	853153.7

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

Well Cap: Geoprobe Systems, Inc.

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

FIRST WATER: 14.05ft  
REFUSAL: not encountered  
OTHER:

**CH2MHILL**

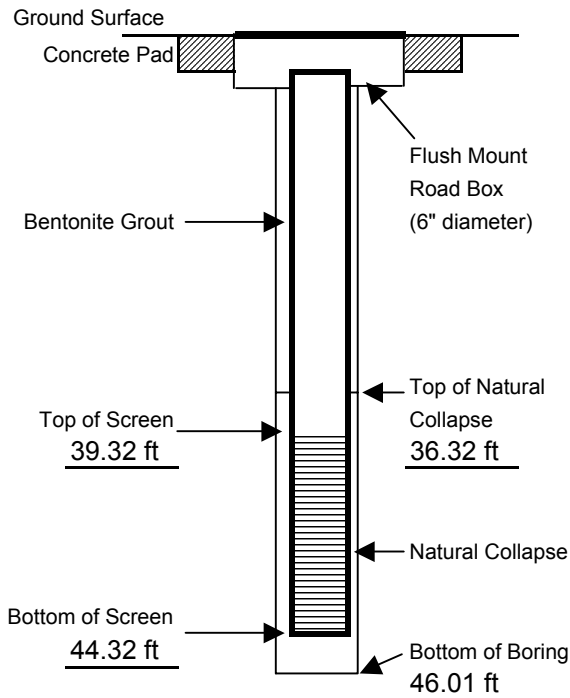
## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

**Project Name:** FS-28  
**Project Number:** 324146-SPEIM-FS28  
**Date Started:** 18-Oct-05  
**Date Completed:** 20-Oct-05  
**Rig Type:** Geoprobe 6620DT  
**Rig Operator:** T.O'Connell/T. Irvine  
**Borehole Diameter (In):** 2.1  
**Well Diameter (In):** 0.5

**LOC ID:** 69PZ0021B  
**Total Borehole Depth:** 46.01 ft bgs  
**Total Well Depth:** 44.32 ft TOC  
**Construction Materials:** Schedule 40 PVC  
**MP Elevation:** 34.11 ft msl  
**Surface Elevation:** 34.3 ft msl  
**Northing:** 220250  
**Easting:** 853157.9

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

**Well Riser:** Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

**Well Screen:** Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

**Bentonite Grout:** Cetco Super GelX Drilling Fluid and potable water mix.

**Flush Mount Box:** Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

**Well Cap:** Geoprobe Systems, Inc.

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

**FIRST WATER:** 14.05ft  
**REFUSAL:** not encountered  
**OTHER:**

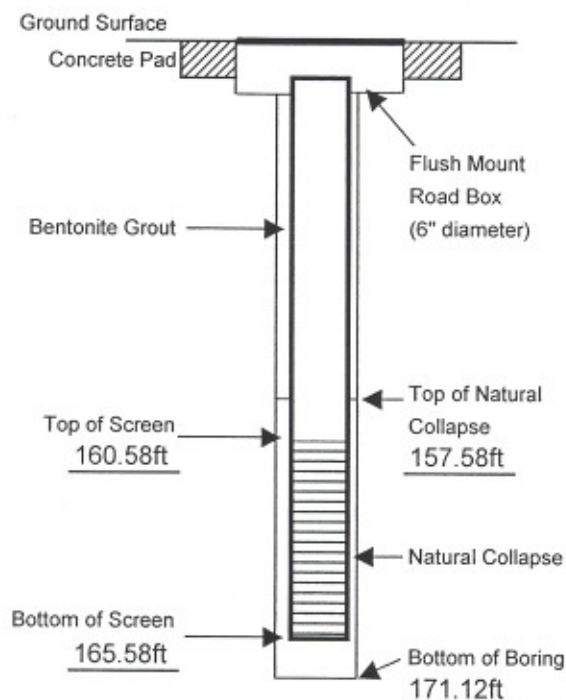




## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0022A
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	171.12ft bgs
Date Started:	23-Nov-05	Total Well Depth:	165.58ft ftoc
Date Completed:	28-Nov-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	24.64 ft msl
Rig Operator:	K.Lyons/T.Irvine	Surface Elevation:	24.89 ft msl
Borehole Diameter (in):	2.1	Northing:	219268.8
Well Diameter (in):	0.5	Easting:	853575.2

### GRAPHICAL REPRESENTATION



### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

Well Cap: Geoprobe Systems, Inc.

### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

### INSTALLATION NOTES:

FIRST WATER: 6.27ft  
REFUSAL: not encountered  
OTHER:

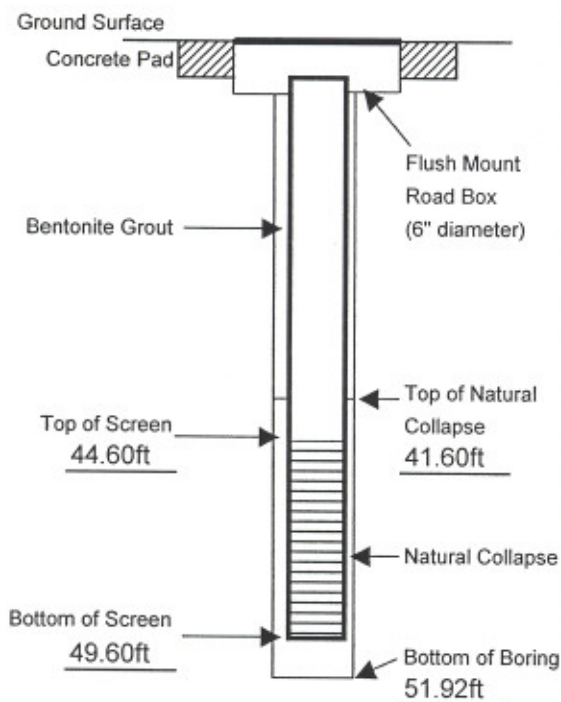
**CH2MHILL**

## SMALL DIAMETER DRIVEN WELL INSTALLATION LOG

### PIEZOMETER/WELL INSTALLATION DIAGRAM

Project Name:	FS-28	LOC ID:	69PZ0022B
Project Number:	324146-SPEIM-FS28	Total Borehole Depth:	51.92ft bgs
Date Started:	21_Nov-05	Total Well Depth:	49.60ft floc
Date Completed:	21_Nov-05	Construction Materials:	Schedule 40 PVC
Rig Type:	Geoprobe 6620DT	MP Elevation:	24.65 ft msl
Rig Operator:	K.Lyons/T.Irvine	Surface Elevation:	24.92 ft msl
Borehole Diameter (In):	2.1	Northing:	219264.9
Well Diameter (In):	0.5	Easting:	853576.1

#### GRAPHICAL REPRESENTATION



#### PIEZOMETER/WELL MATERIAL DESCRIPTIONS

Well Riser: Schedule 40 PVC; flush joint threaded; 0.5-inch inner diameter; 5-foot long sections.

Well Screen: Schedule 40 PVC; flush joint threaded; 0.010-inch slot size; 0.5-inch diameter; 5-foot long sections; outer stainless steel wire mesh with 0.011-inch pore size; annular space filled with 20/40 quartz sand filter pack.

Bentonite Grout: Cetco Super GelX Drilling Fluid and potable water mix.

Flush Mount Box: Environmental Manufacturing, Inc.; steel construction; 7-inch diameter; 10-inch depth.

Well Cap: Geoprobe Systems, Inc.

#### LEGEND:

LOC ID: Location Identification  
MP: Measuring Point  
in: inches  
ft: feet  
msl: mean sea level

#### INSTALLATION NOTES:

FIRST WATER: 6.73ft  
REFUSAL: not encountered  
OTHER:

## APPENDIX A

### Boring Logs

#### Soil

[69BH2000](#)

[69BH2001](#)

[69MW0012A](#)

[69MW1306AB](#)

[69MW1308](#)

[69MW1309](#)

[69MW1318A](#)

[69PZ0004AB](#)

#### Water

[69BH2001](#)

[69MW0012A](#)

[69MW1318A](#)

[69PZ0004AB](#)



## APPENDIX B

### Well Construction Diagrams

[69MW0012A](#)

[69PZ0012AB](#)

[69MW1306C](#)

[69MW1317C](#)

[69PZ0004AB](#)

[69PZ0005A](#)

[69PZ0005B](#)

[69PZ0006B](#)

[69PZ0013A](#)

[69PZ0013B](#)

[69PZ0017A](#)

[69PZ0017B](#)

[69PZ0018A](#)

[69PZ0018B](#)

[69PZ0019A](#)

[69PZ0019B](#)

[69PZ0020A](#)

[69PZ0020B](#)

[69PZ0021A](#)

[69PZ0021B](#)

[69PZ0022A](#)

[69PZ0022B](#)

## **APPENDIX C**

### **Grain Size Analysis**

#### **Table C-1 Estimates of Hydraulic Conductivity Calculated from Grain-Size Data**

**69BH2000**

**69BH2001**

**69MW0012A**

**69PZ0004A**

# **APPENDIX D**

## **Plume Shell Development**

## TABLE OF CONTENTS

D1.0 PLUME SHELL DEVELOPMENT .....	D-1
D1.1 Contaminant Data Set .....	D-1
D1.2 Interpolation of Contaminant Concentrations .....	D-1
D1.3 Plume Shell Scaling .....	D-2
D1.4 Plume Shell Masking .....	D-2
D1.5 Plume Shell Contaminant Mass and Volume .....	D-2
D1.6 Areas of Plume Shell Uncertainty .....	D-3

### **Figure**

<a href="#">Figure D-1</a>	2006 Plume Shell with Capture Zones for 69EW0001 and SWP System Under Current Design
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### **Tables**

<a href="#">Table D-1</a>	FS-28 2006 EDB Plume Shell Data Set
<a href="#">Table D-2</a>	FS-28 EDB Plume Shell Statistics

## **D1.0 PLUME SHELL DEVELOPMENT**

A new ethylene dibromide (EDB) plume shell was constructed for the Fuel Spill-28 (FS-28) plume and is shown in [Figure D-1](#). This plume shell will be referred to as the FS-28 2006 plume shell. A geostatistical interpolation method called kriging was used to perform this task. Contaminant plume shells provide a convenient mechanism for visualizing plumes in three dimensions as well as initializing groundwater models for running contaminant transport simulations. The development of the plume shell is further described below.

### **D1.1 Contaminant Data Set**

The data used to develop the EDB plume shell is listed in [Table D-1](#), and includes groundwater sample dates ranging from 21 April 2004 to 17 January 2006. The maximum EDB sample concentration of 4.05 micrograms per liter ( $\mu\text{g/L}$ ) was collected from 128-foot depth (mid-screen elevation of -100.5 feet mean sea level) at direct push location 69DP0102. Representative elevations for the chemical data were assumed to be the midpoint of the screen interval of the well or sample interval for vertical profile locations. A zero result was substituted for all contaminant nondetects.

### **D1.2 Interpolation of Contaminant Concentrations**

The contaminant concentrations from the sampling data set were interpolated to the plume shell grid using kriging. The interpolated contaminant concentrations were contoured and visualized using wire-net isosurfaces. The kriging process was adjusted until the resulting plume shell fit the known data as closely as possible and was hydrologically plausible. The isosurface representing the concentration of  $0.02 \mu\text{g/L}$ , which corresponds to the Massachusetts Maximum Contaminant Level for EDB, was considered to be the plume boundary for the plume shell.

### **D1.3 Plume Shell Scaling**

Kriging is a linear, unbiased, least-squares spatial interpolation method that uses a weighted-average estimator to estimate the value of a regionalized variable at a spatial location. Since the estimated contaminant concentration at a particular location is derived from the weighted averaging of nearby concentration data, the maximum interpolated contaminant concentrations are generally smaller than the actual maximum data point concentrations. To offset this tendency, the interpolated values were scaled by the ratio of the highest observed value to the highest interpolated value. This forces a match between the highest observed and interpolated values, but likely results in an overestimation of the plume mass.

### **D1.4 Plume Shell Masking**

The plume shell was masked to eliminate artifacts of the kriging process that would otherwise produce hydraulically unreasonable extensions of the plume into areas with no data coverage. The mask is the plan view of the maximum lateral extent of contamination present at a 0.02 µg/L concentration.

### **D1.5 Plume Shell Contaminant Mass and Volume**

The EDB plume shell is shown in [Figure D-1](#). Assuming an aquifer porosity of 30 percent and a 0.02 µg/L plume boundary, the estimated volume of contaminated groundwater and contaminant mass in the EDB plume shell are  $2.60 \times 10^8$  cubic feet (ft<sup>3</sup>) and 5.41 pounds (lbs), respectively. This compares to  $2.25 \times 10^8$  ft<sup>3</sup> and 5.91 lbs, respectively, for the 2003 version of the FS-28 EDB plume shell. This estimate of volume and mass is subdivided into three separate zones (mass and volume north of extraction well 69EW0001, mass and volume captured by the shallow wellpoint [SWP] system, and uncaptured mass and volume) in the [Table D-2](#).

North of deep extraction well 69EW0001, the plume shell mass has decreased and the volume has increased compared to the 2003 plume shell version. Samples collected from direct push locations 69DP0105, 69DP0106, and 69DP0108 have increased the vertical



thickness of the plume shell immediately north of the deep extraction well. EDB detected at 1.62 µg/L at monitoring well 69MW1315 April 2005, which was not sampled for the 2003 plume shell update, has extended the 2006 plume shell approximately 400 feet westward just north of the extraction well, and this westward expansion continues north to well 69MW1416. Also, a nondetect sample from well 69MW1313, which wasn't sampled for the 2003 plume shell update, has redefined the eastern plume shell boundary (approximately 375 feet westward) in the vicinity of that well.

In the vicinity of the SWP system, the 2006 plume shell has less contaminant mass and volume than the 2003 plume shell version. These reductions in plume mass and volume can most likely be attributed to the operation of the SWP system. The most recent samples collected from wells 69MW1285A,B and some of the shallow well points have lower EDB concentrations than samples collected for the 2003 plume shell.

South of the SWP system, samples collected from the drilling locations have refined the characterization of the uncaptured portion of the plume resulting in less mass and more volume in this portion of the 2006 plume shell than in the 2003 plume shell. The mass in this portion of the 2003 plume shell was based on two monitoring well sample results, 3.7 µg/L at 69MW1318A and 0.26 µg/L at 69MW1306A (Table 3-3 in the main body of this technical memorandum). The mass of the 2006 plume shell was based on the monitoring well and drilling data detailed in Section 3.3 in the main body of this technical memorandum. The 2006 plume shell extends over 1,500 feet further south, than the 2003 plume shell, is narrower, and has an additional shallow lobe that extends southeastward toward the Coonamessett River.

## **D1.6 Areas of Plume Shell Uncertainty**

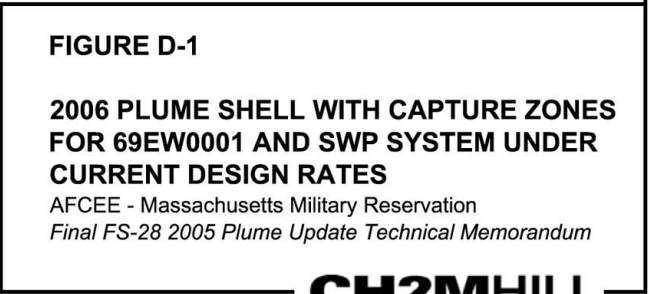
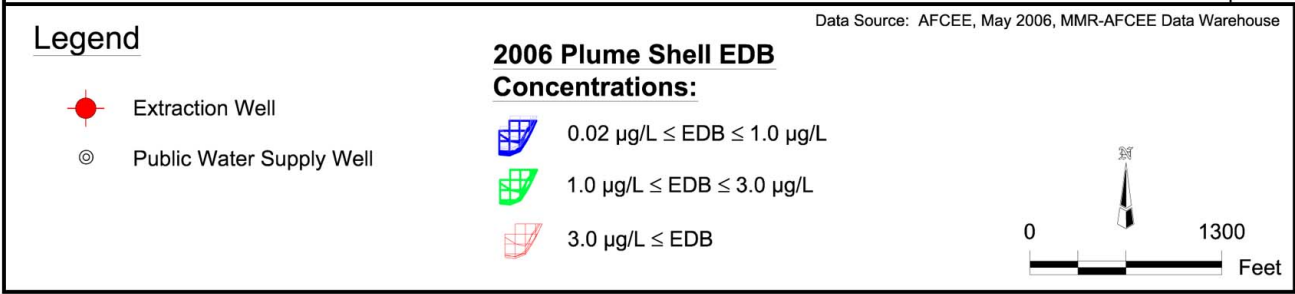
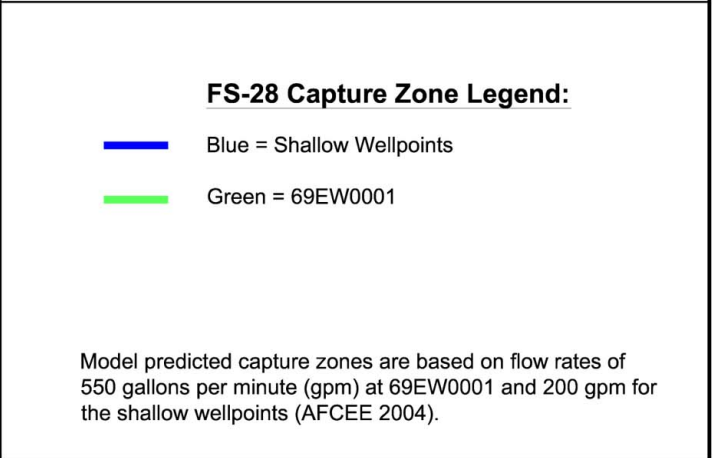
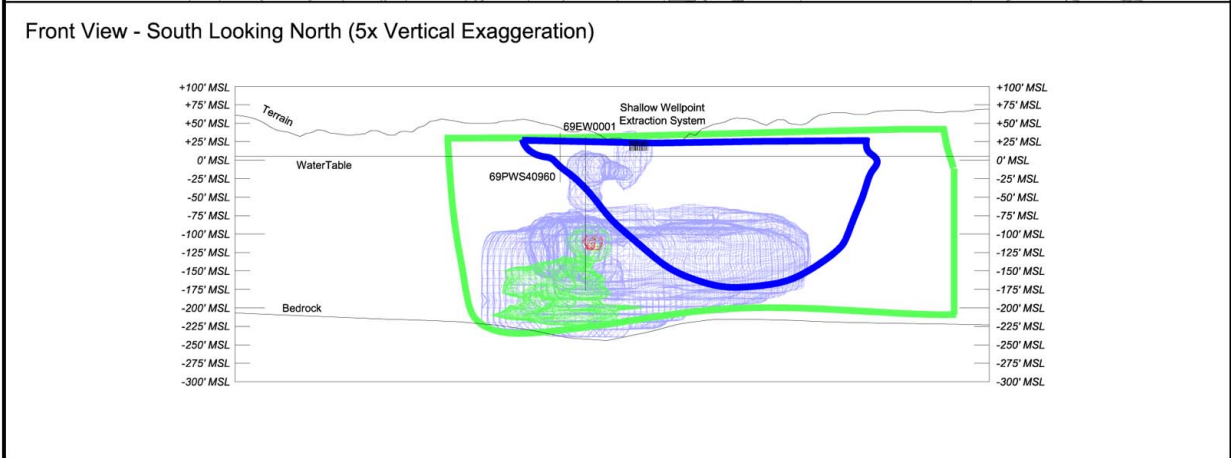
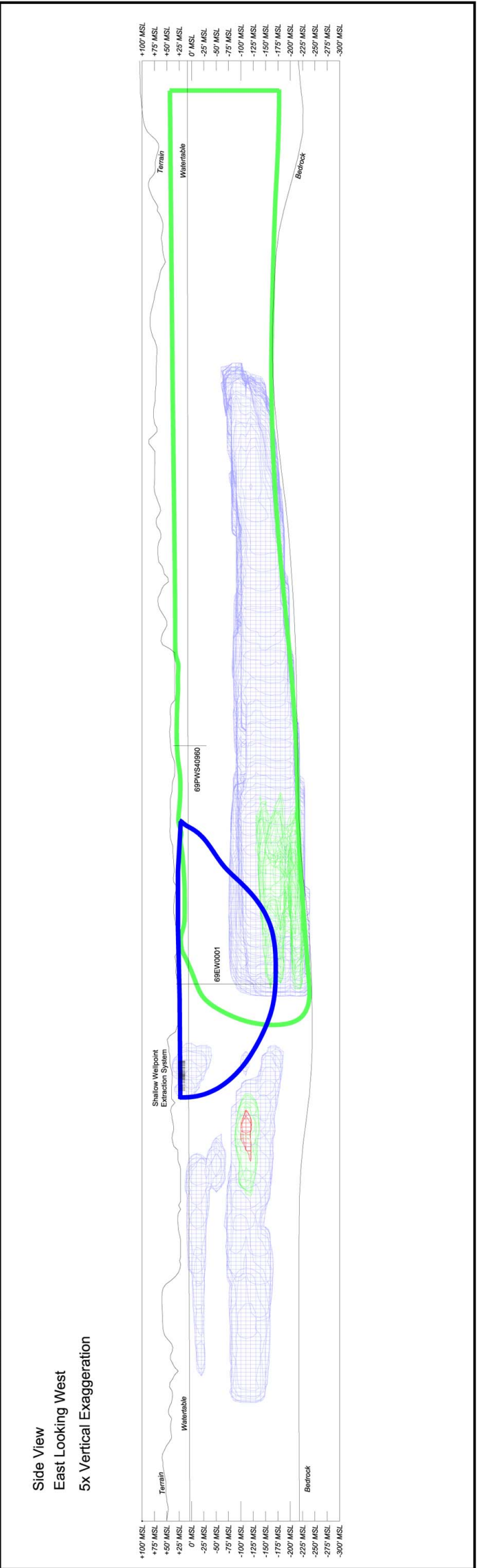
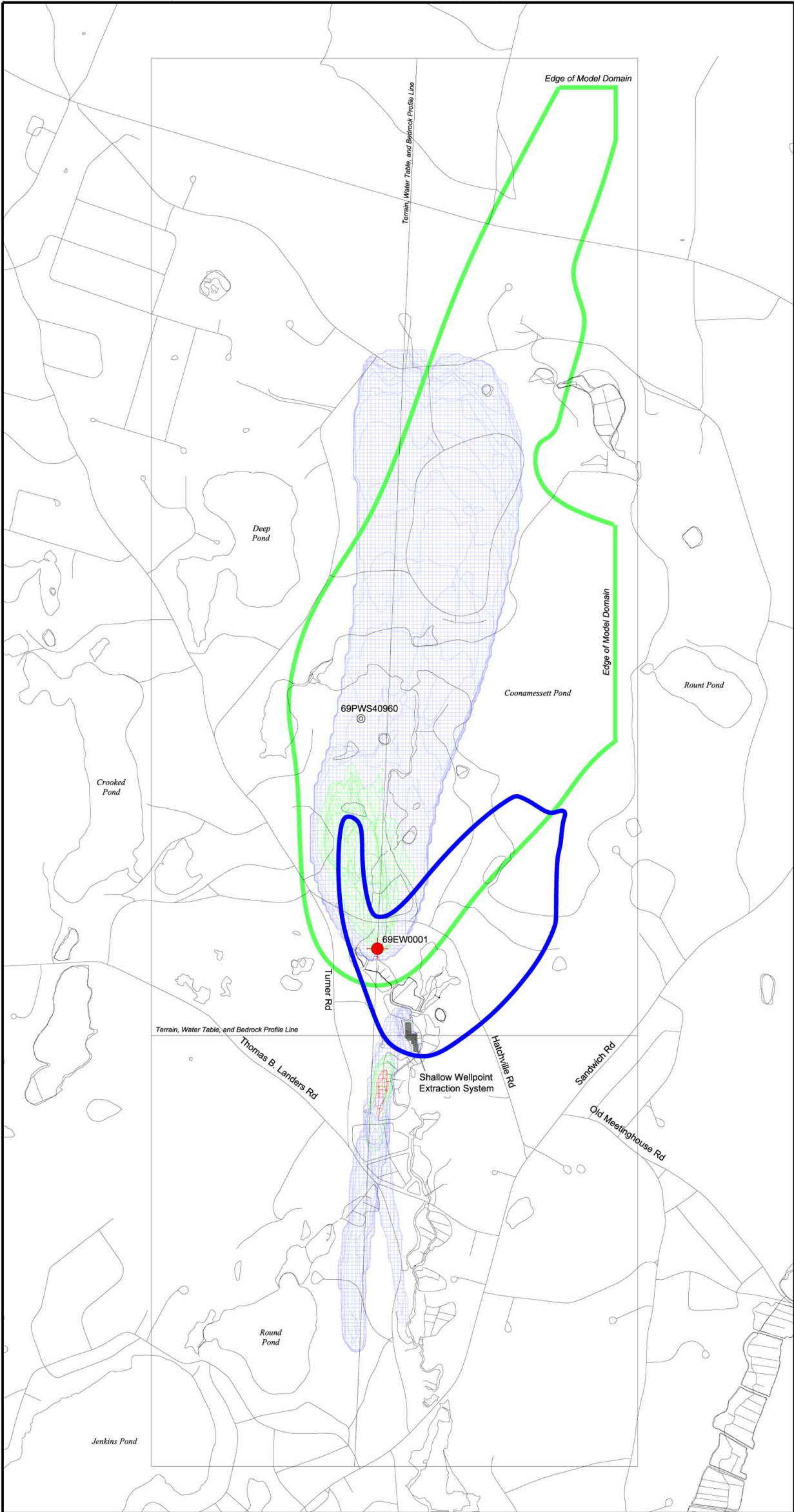
The FS-28 2006 EDB plume shell contains some areas of uncertainty. North of extraction well 69EW0001, uncertainty exists in the definition of the western boundary of the plume shell. This uncertainty could be reduced by a one-time sampling of well 69MW1316, which was last sampled in 1998. Uncertainty also exists in the vertical characterization of the plume shell north of extraction well 69EW0001, the bottom

boundary of the plume shell is not well defined due to a lack of monitoring locations at appropriate elevations. This uncertainty in the vertical boundary adds significant uncertainty to the plume shell mass and volume statistics. It should be noted that these uncertainties in the plume shell boundary are north of extraction well 69EW0001 and are well within the model-predicted capture zone for 69EW0001. Finally, the southeastern boundary of the shallow lobe of contamination that extends toward the Coonamessett River is somewhat uncertain. Direct push location 69DP0129 controls the western side of this lobe but there is no characterization data on the southeast side of the shallow lobe.

## APPENDIX E

### Vertical Profile Groundwater Data

<a href="#"><u>69BH2001</u></a>	<a href="#"><u>69DP0112</u></a>	<a href="#"><u>69DP0124</u></a>
<a href="#"><u>69DP0101</u></a>	<a href="#"><u>69DP0113</u></a>	<a href="#"><u>69DP0125</u></a>
<a href="#"><u>69DP0102</u></a>	<a href="#"><u>69DP0114</u></a>	<a href="#"><u>69DP0126</u></a>
<a href="#"><u>69DP0103</u></a>	<a href="#"><u>69DP0115</u></a>	<a href="#"><u>69DP0127</u></a>
<a href="#"><u>69DP0104</u></a>	<a href="#"><u>69DP0116</u></a>	<a href="#"><u>69DP0128</u></a>
<a href="#"><u>69DP0105</u></a>	<a href="#"><u>69DP0117</u></a>	<a href="#"><u>69DP0129</u></a>
<a href="#"><u>69DP0106</u></a>	<a href="#"><u>69DP0118</u></a>	<a href="#"><u>69DP0130</u></a>
<a href="#"><u>69DP0107</u></a>	<a href="#"><u>69DP0119</u></a>	<a href="#"><u>69DP0131</u></a>
<a href="#"><u>69DP0108</u></a>	<a href="#"><u>69DP0120</u></a>	<a href="#"><u>69MW0012A</u></a>
<a href="#"><u>69DP0109</u></a>	<a href="#"><u>69DP0121</u></a>	<a href="#"><u>69PZ0004A</u></a>
<a href="#"><u>69DP0110</u></a>	<a href="#"><u>69DP0122</u></a>	<a href="#"><u>69PZ0006A</u></a>
<a href="#"><u>69DP0111</u></a>	<a href="#"><u>69DP0123</u></a>	



**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
02EW0016	854997	231163	-67	0	12/5/2005
32MW2002	852193	231808	-154	0	7/11/2005
32MW2003	852193	231808	-4	0	7/11/2005
69BH2001	853433	220906	-3	0	1/5/2006
69BH2001	853433	220906	-13	0.009	1/6/2006
69BH2001	853433	220906	-23	0	1/6/2006
69BH2001	853433	220906	-33	0	1/6/2006
69BH2001	853433	220906	-43	0	1/6/2006
69BH2001	853433	220906	-53	0	1/6/2006
69BH2001	853433	220906	-63	0	1/6/2006
69BH2001	853433	220906	-73	0	1/6/2006
69BH2001	853433	220906	-83	0	1/6/2006
69BH2001	853433	220906	-93	0	1/9/2006
69BH2001	853433	220906	-103	0	1/9/2006
69BH2001	853433	220906	-113	0	1/9/2006
69BH2001	853433	220906	-123	0	1/9/2006
69BH2001	853433	220906	-133	0	1/9/2006
69BH2001	853433	220906	-143	0	1/10/2006
69BH2001	853433	220906	-153	0	1/10/2006
69BH2001	853433	220906	-163	0	1/10/2006
69BH2001	853433	220906	-173	0	1/10/2006
69BH2001	853433	220906	-183	0	1/10/2006
69BH2001	853433	220906	-193	0	1/11/2006
69BH2001	853433	220906	-203	0	1/11/2006
69BH2001	853433	220906	-213	0	1/11/2006
69DP0101	853494	223549	20	0	5/26/2004
69DP0101	853494	223549	10	0	5/26/2004
69DP0101	853494	223549	0	0	5/26/2004
69DP0101	853494	223549	-10	0	5/26/2004
69DP0101	853494	223549	-80	0.007	5/27/2004
69DP0101	853494	223549	-90	0.004	5/27/2004
69DP0101	853494	223549	-100	0.004	5/27/2004
69DP0101	853494	223549	-110	0.047	5/27/2004
69DP0101	853494	223549	-120	0.009	5/28/2004
69DP0101	853494	223549	-130	0.004	6/1/2004
69DP0101	853494	223549	-140	0.003	6/1/2004
69DP0101	853494	223549	-160	0.003	6/1/2004
69DP0101	853494	223549	-170	0.003	6/2/2004
69DP0101	853494	223549	-180	0.049	6/2/2004
69DP0101	853494	223549	-190	0	6/2/2004
69DP0101	853494	223549	-200	0.003	6/2/2004
69DP0101	853494	223549	-210	0	6/4/2004
69DP0102	853282	222830	19	0	6/10/2004
69DP0102	853282	222830	9	0	6/10/2004
69DP0102	853282	222830	-1	0	6/10/2004
69DP0102	853282	222830	-11	0	6/10/2004
69DP0102	853282	222830	-21	0	6/10/2004
69DP0102	853282	222830	-31	0	6/10/2004

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69DP0102	853282	222830	-41	0	6/10/2004
69DP0102	853282	222830	-51	0	6/10/2004
69DP0102	853282	222830	-61	0	6/10/2004
69DP0102	853282	222830	-71	0	6/11/2004
69DP0102	853282	222830	-81	0	6/11/2004
69DP0102	853282	222830	-91	0.037	6/11/2004
69DP0102	853282	222830	-101	4.05	6/11/2004
69DP0102	853282	222830	-111	3.38	6/11/2004
69DP0102	853282	222830	-121	3.14	6/11/2004
69DP0102	853282	222830	-131	1.14	6/15/2004
69DP0102	853282	222830	-141	0.146	6/15/2004
69DP0102	853282	222830	-151	0.036	6/15/2004
69DP0102	853282	222830	-161	0.033	6/15/2004
69DP0102	853282	222830	-171	0	6/15/2004
69DP0103	853239	222477	16	0	6/16/2004
69DP0103	853239	222477	6	0	6/16/2004
69DP0103	853239	222477	-4	0	6/16/2004
69DP0103	853239	222477	-14	0	6/16/2004
69DP0103	853239	222477	-24	0	6/16/2004
69DP0103	853239	222477	-34	0.004	6/16/2004
69DP0103	853239	222477	-44	0.054	6/16/2004
69DP0103	853239	222477	-54	0.089	6/16/2004
69DP0103	853239	222477	-64	0	6/17/2004
69DP0103	853239	222477	-74	0	6/17/2004
69DP0103	853239	222477	-84	0	6/17/2004
69DP0103	853239	222477	-94	0.118	6/17/2004
69DP0103	853239	222477	-104	1.31	6/17/2004
69DP0103	853239	222477	-114	3.08	6/17/2004
69DP0103	853239	222477	-124	2.62	6/17/2004
69DP0103	853239	222477	-134	0.272	6/17/2004
69DP0103	853239	222477	-144	0.223	6/18/2004
69DP0103	853239	222477	-154	0.093	6/18/2004
69DP0104	853144	221771	19	0	6/4/2004
69DP0104	853144	221771	9	0	6/4/2004
69DP0104	853144	221771	-1	0	6/7/2004
69DP0104	853144	221771	-11	0.002	6/7/2004
69DP0104	853144	221771	-21	0.003	6/7/2004
69DP0104	853144	221771	-31	0	6/7/2004
69DP0104	853144	221771	-41	0	6/7/2004
69DP0104	853144	221771	-51	0	6/7/2004
69DP0104	853144	221771	-61	0	6/7/2004
69DP0104	853144	221771	-71	0	6/7/2004
69DP0104	853144	221771	-161	0	6/9/2004
69DP0104	853144	221771	-171	0	6/9/2004
69DP0105	853161	224467	22	0	7/22/2004
69DP0105	853161	224467	12	0	7/22/2004
69DP0105	853161	224467	2	0	7/22/2004
69DP0105	853161	224467	-8	0	7/22/2004



**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69DP0105	853161	224467	-18	0	7/22/2004
69DP0105	853161	224467	-28	0	7/22/2004
69DP0105	853161	224467	-38	0	7/22/2004
69DP0105	853161	224467	-48	0	7/22/2004
69DP0105	853161	224467	-58	0	7/23/2004
69DP0105	853161	224467	-68	0.003	7/23/2004
69DP0105	853161	224467	-78	0.019	7/23/2004
69DP0105	853161	224467	-88	0.04	7/23/2004
69DP0105	853161	224467	-98	0.058	7/23/2004
69DP0105	853161	224467	-108	0.146	7/23/2004
69DP0105	853161	224467	-118	0.192	7/23/2004
69DP0105	853161	224467	-128	0.573	7/26/2004
69DP0105	853161	224467	-138	0.875	7/26/2004
69DP0106	853569	225005	21	0	7/27/2004
69DP0106	853569	225005	11	0	7/27/2004
69DP0106	853569	225005	1	0	7/27/2004
69DP0106	853569	225005	-9	0	7/27/2004
69DP0106	853569	225005	-19	0	7/27/2004
69DP0106	853569	225005	-29	0	7/27/2004
69DP0106	853569	225005	-39	0	7/27/2004
69DP0106	853569	225005	-49	0	7/27/2004
69DP0106	853569	225005	-59	0	7/27/2004
69DP0106	853569	225005	-69	0	7/27/2004
69DP0106	853569	225005	-79	0	7/28/2004
69DP0106	853569	225005	-89	0	7/28/2004
69DP0106	853569	225005	-99	0	7/28/2004
69DP0106	853569	225005	-109	0.008	7/28/2004
69DP0106	853569	225005	-119	0.135	7/28/2004
69DP0106	853569	225005	-129	0.362	7/28/2004
69DP0106	853569	225005	-139	0.091	7/29/2004
69DP0106	853569	225005	-149	0.077	7/29/2004
69DP0106	853569	225005	-159	0.233	7/29/2004
69DP0106	853569	225005	-169	0.106	7/29/2004
69DP0106	853569	225005	-179	0.076	7/29/2004
69DP0106	853569	225005	-189	0.541	7/29/2004
69DP0106	853569	225005	-199	1.38	7/29/2004
69DP0106	853569	225005	-209	0.467	7/30/2004
69DP0107	853261	225507	26	0	7/30/2004
69DP0107	853261	225507	16	0	7/30/2004
69DP0107	853261	225507	6	0	7/30/2004
69DP0107	853261	225507	-4	0	7/30/2004
69DP0107	853261	225507	-14	0	8/2/2004
69DP0107A	853260	225505	-24	0	8/2/2004
69DP0107A	853260	225505	-34	0	8/2/2004
69DP0107A	853260	225505	-44	0	8/2/2004
69DP0107A	853260	225505	-54	0	8/3/2004
69DP0108	853217	224296	21	0	7/19/2004
69DP0108	853217	224296	11	0	7/19/2004

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

<b>Sample Location</b>	<b>Surface Easting Coordinate (ft)</b>	<b>Surface Northing Coordinate (ft)</b>	<b>Sample Elevation (ft msl)</b>	<b>EDB Concentration (µg/L)</b>	<b>Sample Date</b>
69DP0108	853217	224296	1	0	7/19/2004
69DP0108	853217	224296	-9	0	7/19/2004
69DP0108	853217	224296	-19	0	7/19/2004
69DP0108	853217	224296	-29	0	7/19/2004
69DP0108	853217	224296	-39	0	7/19/2004
69DP0108	853217	224296	-49	0	7/19/2004
69DP0108	853217	224296	-59	0	7/20/2004
69DP0108	853217	224296	-69	0	7/20/2004
69DP0108	853217	224296	-79	0	7/20/2004
69DP0108	853217	224296	-89	0	7/20/2004
69DP0108	853217	224296	-99	0	7/20/2004
69DP0108	853217	224296	-109	0	7/20/2004
69DP0108	853217	224296	-119	0	7/20/2004
69DP0108	853217	224296	-129	0.004	7/21/2004
69DP0108	853217	224296	-139	0.121	7/21/2004
69DP0108	853217	224296	-149	0.73	7/21/2004
69DP0108	853217	224296	-159	1.86	7/21/2004
69DP0110	852852	221435	18	0	4/6/2005
69DP0110	852852	221435	8	0	4/6/2005
69DP0110	852852	221435	-3	0	4/6/2005
69DP0110	852852	221435	-13	0	4/6/2005
69DP0110	852852	221435	-23	0	4/6/2005
69DP0110	852852	221435	-33	0	4/6/2005
69DP0110	852852	221435	-43	0	4/7/2005
69DP0110	852852	221435	-53	0	4/7/2005
69DP0110	852852	221435	-63	0	4/7/2005
69DP0110	852852	221435	-73	0	4/7/2005
69DP0110	852852	221435	-83	0	4/7/2005
69DP0110	852852	221435	-93	0	4/7/2005
69DP0110	852852	221435	-103	0	4/7/2005
69DP0110	852852	221435	-113	0	4/8/2005
69DP0110	852852	221435	-123	0	4/8/2005
69DP0110	852852	221435	-133	0	4/8/2005
69DP0110	852852	221435	-143	0	4/8/2005
69DP0110	852852	221435	-153	0	4/8/2005
69DP0110	852852	221435	-163	0	4/11/2005
69DP0110	852852	221435	-173	0	4/11/2005
69DP0110	852852	221435	-183	0	4/11/2005
69DP0110	852852	221435	-188	0	4/11/2005
69DP0111	853125	221457	16	0	4/12/2005
69DP0111	853125	221457	6	0	4/12/2005
69DP0111	853125	221457	-5	0	4/12/2005
69DP0111	853125	221457	-15	0	4/12/2005
69DP0111	853125	221457	-25	0	4/12/2005
69DP0111	853125	221457	-35	0	4/12/2005
69DP0111	853125	221457	-45	0	4/13/2005
69DP0111	853125	221457	-55	0	4/13/2005
69DP0111	853125	221457	-65	0	4/13/2005

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69DP0111	853125	221457	-75	0	4/13/2005
69DP0111	853125	221457	-85	0	4/13/2005
69DP0111	853125	221457	-95	0.05	4/13/2005
69DP0111	853125	221457	-105	0.006	4/13/2005
69DP0111	853125	221457	-115	0.027	4/13/2005
69DP0111	853125	221457	-125	0.328	4/14/2005
69DP0111	853125	221457	-135	0.653	4/14/2005
69DP0111	853125	221457	-145	0.474	4/14/2005
69DP0111	853125	221457	-155	0.067	4/14/2005
69DP0111	853125	221457	-165	0.013	4/14/2005
69DP0111	853125	221457	-175	0.01	4/14/2005
69DP0111	853125	221457	-185	0.007	4/15/2005
69DP0111	853125	221457	-195	0.009	4/15/2005
69DP0111	853125	221457	-200	0.009	4/15/2005
69DP0112	853243	221707	16	0	11/22/2004
69DP0112	853243	221707	6	0	11/22/2004
69DP0112	853243	221707	-4	0	11/22/2004
69DP0112	853243	221707	-14	0.006	11/22/2004
69DP0112	853243	221707	-24	0.027	11/22/2004
69DP0112	853243	221707	-34	0.012	11/22/2004
69DP0112	853243	221707	-44	0.002	11/22/2004
69DP0112	853243	221707	-64	0	11/23/2004
69DP0112	853243	221707	-74	0	11/23/2004
69DP0112	853243	221707	-84	0	11/23/2004
69DP0112	853243	221707	-94	0	11/24/2004
69DP0112	853243	221707	-104	0	11/24/2004
69DP0112	853243	221707	-114	0	11/24/2004
69DP0112	853243	221707	-124	0	11/29/2004
69DP0112	853243	221707	-134	0	11/30/2004
69DP0112	853243	221707	-144	0	11/30/2004
69DP0112	853243	221707	-154	0	11/30/2004
69DP0112	853243	221707	-164	0	12/1/2004
69DP0112	853243	221707	-173	0	12/1/2004
69DP0113	853299	221808	14	0	12/20/2004
69DP0113	853299	221808	4	0.034	12/20/2004
69DP0113	853299	221808	-7	0.381	12/20/2004
69DP0113	853299	221808	-17	0.34	12/20/2004
69DP0113	853299	221808	-27	0.003	12/20/2004
69DP0113	853299	221808	-37	0	12/20/2004
69DP0113	853299	221808	-47	0	12/20/2004
69DP0113	853299	221808	-57	0	1/7/2005
69DP0113	853299	221808	-67	0	1/7/2005
69DP0113	853299	221808	-77	0	1/7/2005
69DP0113	853299	221808	-87	0	1/7/2005
69DP0113	853299	221808	-97	0	1/7/2005
69DP0113	853299	221808	-107	0	1/7/2005
69DP0113	853299	221808	-117	0	1/7/2005
69DP0113	853299	221808	-137	0	1/13/2005

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

<b>Sample Location</b>	<b>Surface Easting Coordinate (ft)</b>	<b>Surface Northing Coordinate (ft)</b>	<b>Sample Elevation (ft msl)</b>	<b>EDB Concentration (µg/L)</b>	<b>Sample Date</b>
69DP0113	853299	221808	-147	0	1/13/2005
69DP0113	853299	221808	-157	0	1/13/2005
69DP0114	853118	222003	15	0	12/13/2004
69DP0114	853118	222003	5	0	12/13/2004
69DP0114	853118	222003	-5	0	12/13/2004
69DP0114	853118	222003	-15	0	12/13/2004
69DP0114	853118	222003	-25	0	12/13/2004
69DP0114	853118	222003	-35	0	12/13/2004
69DP0114	853118	222003	-45	0	12/13/2004
69DP0114	853118	222003	-55	0	12/13/2004
69DP0114	853118	222003	-66	0	12/14/2004
69DP0114	853118	222003	-76	0.002	12/14/2004
69DP0114	853118	222003	-86	0.13	12/14/2004
69DP0114	853118	222003	-96	0.755	12/14/2004
69DP0114	853118	222003	-106	0.699	12/14/2004
69DP0114	853118	222003	-116	0.567	12/14/2004
69DP0114	853118	222003	-126	0.205	12/15/2004
69DP0114	853118	222003	-136	0.079	12/15/2004
69DP0114	853118	222003	-146	0.048	12/15/2004
69DP0114	853118	222003	-154	0.008	12/15/2004
69DP0115	853382	222080	14	0	12/6/2004
69DP0115	853382	222080	4	0	12/6/2004
69DP0115	853382	222080	-7	0	12/6/2004
69DP0115	853382	222080	-17	0	12/6/2004
69DP0115	853382	222080	-27	0	12/6/2004
69DP0115	853382	222080	-37	0	12/6/2004
69DP0115	853382	222080	-47	0	12/7/2004
69DP0115	853382	222080	-57	0	12/7/2004
69DP0115	853382	222080	-67	0	12/7/2004
69DP0115	853382	222080	-77	0	12/7/2004
69DP0115	853382	222080	-87	0	12/7/2004
69DP0115	853382	222080	-97	0	12/7/2004
69DP0115	853382	222080	-107	0	12/8/2004
69DP0115	853382	222080	-117	0	12/8/2004
69DP0115	853382	222080	-127	0	12/8/2004
69DP0115	853382	222080	-137	0	12/8/2004
69DP0115	853382	222080	-147	0	12/9/2004
69DP0115	853382	222080	-157	0	12/9/2004
69DP0116	853060	221826	19	0	1/19/2005
69DP0116	853060	221826	9	0	1/19/2005
69DP0116	853060	221826	-2	0	1/19/2005
69DP0116	853060	221826	-12	0	1/19/2005
69DP0116	853060	221826	-22	0	1/19/2005
69DP0116	853060	221826	-32	0	1/19/2005
69DP0116	853060	221826	-52	0	3/10/2005
69DP0116	853060	221826	-62	0	3/10/2005
69DP0116	853060	221826	-72	0.01	3/10/2005
69DP0116	853060	221826	-82	0.029	3/10/2005

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69DP0116	853060	221826	-92	0.626	3/10/2005
69DP0116	853060	221826	-102	0.389	3/11/2005
69DP0116	853060	221826	-112	0.112	3/11/2005
69DP0116	853060	221826	-122	0.075	3/11/2005
69DP0116	853060	221826	-132	0.036	3/11/2005
69DP0116	853060	221826	-142	0.015	3/14/2005
69DP0116	853060	221826	-152	0	3/14/2005
69DP0116	853060	221826	-162	0	3/14/2005
69DP0117	853410	221376	9	0	5/16/2005
69DP0117	853410	221376	-2	0	5/16/2005
69DP0117	853410	221376	-12	0.099	5/16/2005
69DP0117	853410	221376	-22	0.009	5/16/2005
69DP0117	853410	221376	-32	0.002	5/16/2005
69DP0117	853410	221376	-52	0	5/16/2005
69DP0117	853410	221376	-62	0	5/18/2005
69DP0117	853410	221376	-72	0	5/18/2005
69DP0117	853410	221376	-82	0	5/18/2005
69DP0117	853410	221376	-92	0	5/18/2005
69DP0117	853410	221376	-102	0	5/18/2005
69DP0117	853410	221376	-112	0	5/18/2005
69DP0117	853410	221376	-122	0	5/18/2005
69DP0118	852966	220775	7	0	6/29/2005
69DP0118	852966	220775	-4	0	6/29/2005
69DP0118	852966	220775	-14	0	6/29/2005
69DP0118	852966	220775	-24	0	6/29/2005
69DP0118	852966	220775	-34	0	6/29/2005
69DP0118	852966	220775	-44	0	6/29/2005
69DP0118	852966	220775	-54	0	6/30/2005
69DP0118	852966	220775	-64	0	6/30/2005
69DP0118	852966	220775	-74	0.006	6/30/2005
69DP0118	852966	220775	-84	0.019	6/30/2005
69DP0118	852966	220775	-94	0.12	6/30/2005
69DP0118	852966	220775	-104	0.357	6/30/2005
69DP0118	852966	220775	-114	0.399	6/30/2005
69DP0118	852966	220775	-124	0.162	7/5/2005
69DP0118	852966	220775	-134	0.099	7/5/2005
69DP0118	852966	220775	-144	0.044	7/5/2005
69DP0118	852966	220775	-154	0.046	7/5/2005
69DP0118	852966	220775	-164	0	7/5/2005
69DP0118	852966	220775	-174	0	7/6/2005
69DP0118	852966	220775	-184	0	7/6/2005
69DP0119	852597	220843	7	0	7/7/2005
69DP0119	852597	220843	-4	0	7/7/2005
69DP0119	852597	220843	-14	0	7/7/2005
69DP0119	852597	220843	-24	0	7/7/2005
69DP0119	852597	220843	-34	0	7/7/2005
69DP0119	852597	220843	-44	0	7/7/2005
69DP0119	852597	220843	-54	0	7/8/2005

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

<b>Sample Location</b>	<b>Surface Easting Coordinate (ft)</b>	<b>Surface Northing Coordinate (ft)</b>	<b>Sample Elevation (ft msl)</b>	<b>EDB Concentration (µg/L)</b>	<b>Sample Date</b>
69DP0119	852597	220843	-64	0	7/8/2005
69DP0119	852597	220843	-74	0	7/8/2005
69DP0119	852597	220843	-84	0	7/8/2005
69DP0119	852597	220843	-94	0	7/11/2005
69DP0119	852597	220843	-104	0	7/11/2005
69DP0119	852597	220843	-114	0	7/11/2005
69DP0119	852597	220843	-124	0	7/11/2005
69DP0119	852597	220843	-134	0	7/11/2005
69DP0119	852597	220843	-144	0	7/12/2005
69DP0119	852597	220843	-154	0	7/12/2005
69DP0119	852597	220843	-164	0	7/12/2005
69DP0119	852597	220843	-174	0	7/12/2005
69DP0119	852597	220843	-181	0	7/12/2005
69DP0120	853648	221114	-6	0	8/2/2005
69DP0120	853648	221114	-11	0	8/2/2005
69DP0120	853648	221114	-21	0	8/2/2005
69DP0120	853648	221114	-31	0	8/2/2005
69DP0120	853648	221114	-41	0	8/2/2005
69DP0120	853648	221114	-51	0	8/2/2005
69DP0120	853648	221114	-61	0	8/3/2005
69DP0120	853648	221114	-71	0	8/3/2005
69DP0120	853648	221114	-81	0	8/3/2005
69DP0120	853648	221114	-91	0	8/3/2005
69DP0120	853648	221114	-101	0	8/3/2005
69DP0120	853648	221114	-111	0	8/3/2005
69DP0120	853648	221114	-121	0	8/3/2005
69DP0120	853648	221114	-131	0	8/4/2005
69DP0120	853648	221114	-141	0	8/4/2005
69DP0120	853648	221114	-151	0	8/4/2005
69DP0120	853648	221114	-161	0	8/4/2005
69DP0120	853648	221114	-171	0	8/4/2005
69DP0120	853648	221114	-181	0.003	8/5/2005
69DP0120	853648	221114	-191	0.002	8/5/2005
69DP0121	853655	221277	9	0	8/9/2005
69DP0121	853655	221277	-2	0	8/9/2005
69DP0121	853655	221277	-12	0	8/9/2005
69DP0121	853655	221277	-22	0	8/9/2005
69DP0121	853655	221277	-32	0	8/9/2005
69DP0121	853655	221277	-42	0	8/9/2005
69DP0121	853655	221277	-62	0	8/10/2005
69DP0121	853655	221277	-72	0	8/10/2005
69DP0121	853655	221277	-82	0	8/10/2005
69DP0121	853655	221277	-92	0	8/10/2005
69DP0121	853655	221277	-102	0	8/10/2005
69DP0121	853655	221277	-112	0	8/10/2005
69DP0121	853655	221277	-122	0	8/11/2005
69DP0121	853655	221277	-132	0	8/11/2005
69DP0121	853655	221277	-142	0	8/11/2005



**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69DP0121	853655	221277	-152	0	8/11/2005
69DP0121	853655	221277	-162	0	8/11/2005
69DP0121	853655	221277	-172	0.003	8/12/2005
69DP0121	853655	221277	-182	0.003	8/12/2005
69DP0122	853535	220969	1	0	7/26/2005
69DP0122	853535	220969	-10	0	7/26/2005
69DP0122	853535	220969	-20	0	7/26/2005
69DP0122	853535	220969	-30	0	7/27/2005
69DP0122	853535	220969	-40	0	7/27/2005
69DP0122	853535	220969	-50	0	7/27/2005
69DP0122	853535	220969	-60	0	7/27/2005
69DP0122	853535	220969	-70	0	7/27/2005
69DP0122	853535	220969	-80	0	7/27/2005
69DP0122	853535	220969	-90	0	7/27/2005
69DP0122	853535	220969	-100	0	7/28/2005
69DP0122	853535	220969	-110	0	7/28/2005
69DP0122	853535	220969	-120	0	7/28/2005
69DP0122	853535	220969	-130	0	7/28/2005
69DP0122	853535	220969	-140	0	7/28/2005
69DP0122	853535	220969	-150	0	7/28/2005
69DP0122	853535	220969	-160	0	7/29/2005
69DP0122	853535	220969	-170	0	7/29/2005
69DP0122	853535	220969	-180	0	7/29/2005
69DP0123	853448	220936	11	0	8/16/2005
69DP0123	853448	220936	1	0	8/16/2005
69DP0123	853448	220936	-20	0.079	8/16/2005
69DP0123	853448	220936	-30	0	8/16/2005
69DP0123	853448	220936	-40	0	8/16/2005
69DP0123	853448	220936	-50	0	8/16/2005
69DP0123	853448	220936	-60	0	8/18/2005
69DP0123	853448	220936	-70	0	8/18/2005
69DP0123	853448	220936	-80	0	8/18/2005
69DP0123	853448	220936	-90	0	8/18/2005
69DP0123	853448	220936	-100	0	8/18/2005
69DP0123	853448	220936	-110	0	8/18/2005
69DP0123	853448	220936	-120	0	8/19/2005
69DP0123	853448	220936	-130	0	8/19/2005
69DP0123	853448	220936	-140	0	8/19/2005
69DP0123	853448	220936	-150	0	8/19/2005
69DP0123	853448	220936	-160	0	8/22/2005
69DP0124	852958	219413	11	0	9/1/2005
69DP0124	852958	219413	1	0	9/1/2005
69DP0124	852958	219413	-10	0	9/1/2005
69DP0124	852958	219413	-20	0	9/6/2005
69DP0124	852958	219413	-30	0	9/6/2005
69DP0124	852958	219413	-40	0	9/6/2005
69DP0124	852958	219413	-50	0	9/6/2005
69DP0124	852958	219413	-60	0	9/6/2005

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69DP0124	852958	219413	-70	0	9/6/2005
69DP0124	852958	219413	-80	0	9/6/2005
69DP0124	852958	219413	-90	0	9/7/2005
69DP0124	852958	219413	-100	0	9/7/2005
69DP0124	852958	219413	-110	0	9/7/2005
69DP0124	852958	219413	-120	0	9/8/2005
69DP0124	852958	219413	-130	0	9/8/2005
69DP0125	852714	219575	7	0	9/9/2005
69DP0125	852714	219575	-4	0	9/9/2005
69DP0125	852714	219575	-14	0	9/9/2005
69DP0125	852714	219575	-24	0	9/9/2005
69DP0125	852714	219575	-34	0	9/9/2005
69DP0125	852714	219575	-44	0	9/9/2005
69DP0125	852714	219575	-54	0	9/12/2005
69DP0125	852714	219575	-64	0	9/12/2005
69DP0125	852714	219575	-74	0	9/12/2005
69DP0125	852714	219575	-84	0	9/12/2005
69DP0125	852714	219575	-94	0	9/12/2005
69DP0125	852714	219575	-104	0	9/12/2005
69DP0125	852714	219575	-114	0	9/13/2005
69DP0125	852714	219575	-124	0	9/13/2005
69DP0126	852774	220385	7	0	9/19/2005
69DP0126	852774	220385	-4	0	9/19/2005
69DP0126	852774	220385	-14	0	9/20/2005
69DP0126	852774	220385	-24	0	9/20/2005
69DP0126	852774	220385	-34	0	9/20/2005
69DP0126	852774	220385	-44	0	9/20/2005
69DP0126	852774	220385	-54	0	9/20/2005
69DP0126	852774	220385	-64	0	9/20/2005
69DP0126	852774	220385	-74	0	9/20/2005
69DP0126	852774	220385	-84	0	9/21/2005
69DP0126	852774	220385	-94	0	9/21/2005
69DP0126	852774	220385	-104	0	9/21/2005
69DP0126	852774	220385	-114	0	9/21/2005
69DP0126	852774	220385	-124	0	9/22/2005
69DP0126	852774	220385	-134	0	9/22/2005
69DP0126	852774	220385	-144	0	9/22/2005
69DP0127	852821	220226	3	0	9/23/2005
69DP0127	852821	220226	-8	0	9/27/2005
69DP0127	852821	220226	-18	0	9/27/2005
69DP0127	852821	220226	-28	0	9/27/2005
69DP0127	852821	220226	-38	0	9/27/2005
69DP0127	852821	220226	-48	0	9/27/2005
69DP0127	852821	220226	-58	0	9/27/2005
69DP0127	852821	220226	-68	0	9/28/2005
69DP0127	852821	220226	-78	0	9/28/2005
69DP0127	852821	220226	-88	0	9/28/2005
69DP0127	852821	220226	-98	0	9/28/2005

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69DP0127	852821	220226	-108	0	9/28/2005
69DP0127	852821	220226	-118	0	9/28/2005
69DP0127	852821	220226	-128	0	9/29/2005
69DP0127	852821	220226	-138	0	9/29/2005
69DP0127	852821	220226	-148	0	9/30/2005
69DP0127	852821	220226	-158	0	9/30/2005
69DP0128	853160	220255	7	0	10/11/2005
69DP0128	853160	220255	-3	0	10/11/2005
69DP0128	853160	220255	-13	0	10/11/2005
69DP0128	853160	220255	-23	0	10/11/2005
69DP0128	853160	220255	-33	0	10/11/2005
69DP0128	853160	220255	-43	0	10/11/2005
69DP0128	853160	220255	-53	0	10/12/2005
69DP0128	853160	220255	-63	0	10/12/2005
69DP0128	853160	220255	-73	0	10/12/2005
69DP0128	853160	220255	-83	0	10/12/2005
69DP0128	853160	220255	-93	0	10/12/2005
69DP0128	853160	220255	-103	0	10/12/2005
69DP0128	853160	220255	-113	0	10/12/2005
69DP0128	853160	220255	-123	0	10/13/2005
69DP0128	853160	220255	-133	0	10/13/2005
69DP0128	853160	220255	-143	0	10/13/2005
69DP0128	853160	220255	-153	0	10/13/2005
69DP0128	853160	220255	-163	0	10/14/2005
69DP0129	853425	220070	9	0	10/21/2005
69DP0129	853425	220070	-2	0	10/21/2005
69DP0129	853425	220070	-12	0	10/21/2005
69DP0129	853425	220070	-22	0.002	10/21/2005
69DP0129	853425	220070	-32	0	10/21/2005
69DP0129	853425	220070	-42	0	10/21/2005
69DP0129	853425	220070	-52	0	10/24/2005
69DP0129	853425	220070	-62	0	10/24/2005
69DP0129	853425	220070	-72	0	10/24/2005
69DP0129	853425	220070	-82	0	10/24/2005
69DP0129	853425	220070	-92	0	10/24/2005
69DP0129	853425	220070	-102	0	10/24/2005
69DP0129	853425	220070	-112	0	10/24/2005
69DP0129	853425	220070	-122	0	10/26/2005
69DP0129	853425	220070	-132	0	10/26/2005
69DP0129	853425	220070	-142	0	10/26/2005
69DP0129	853425	220070	-152	0	10/26/2005
69DP0129	853425	220070	-162	0	10/26/2005
69DP0129	853425	220070	-172	0	10/27/2005
69DP0129	853425	220070	-182	0	10/27/2005
69DP0130	853566	219322	14	0	11/15/2005
69DP0130	853566	219322	4	0	11/15/2005
69DP0130	853566	219322	-7	0	11/15/2005
69DP0130	853566	219322	-17	0	11/15/2005

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

<b>Sample Location</b>	<b>Surface Easting Coordinate (ft)</b>	<b>Surface Northing Coordinate (ft)</b>	<b>Sample Elevation (ft msl)</b>	<b>EDB Concentration (µg/L)</b>	<b>Sample Date</b>
69DP0130	853566	219322	-27	0	11/15/2005
69DP0130	853566	219322	-37	0	11/15/2005
69DP0130	853566	219322	-47	0	11/15/2005
69DP0130	853566	219322	-57	0	11/16/2005
69DP0130	853566	219322	-67	0	11/16/2005
69DP0130	853566	219322	-77	0	11/16/2005
69DP0130	853566	219322	-87	0	11/16/2005
69DP0130	853566	219322	-97	0	11/16/2005
69DP0130	853566	219322	-107	0	11/16/2005
69DP0130	853566	219322	-117	0	11/16/2005
69DP0130	853566	219322	-127	0	11/17/2005
69DP0130	853566	219322	-137	0	11/17/2005
69DP0130	853566	219322	-147	0	11/17/2005
69DP0131	853026	220173	16	0	11/29/2005
69DP0131	853026	220173	6	0	11/29/2005
69DP0131	853026	220173	-5	0	11/29/2005
69DP0131	853026	220173	-15	0	11/29/2005
69DP0131	853026	220173	-25	0	11/29/2005
69DP0131	853026	220173	-35	0	11/29/2005
69DP0131	853026	220173	-45	0	11/30/2005
69DP0131	853026	220173	-55	0	11/30/2005
69DP0131	853026	220173	-65	0.015	11/30/2005
69DP0131	853026	220173	-75	0.008	11/30/2005
69DP0131	853026	220173	-85	0.016	11/30/2005
69DP0131	853026	220173	-95	0.147	11/30/2005
69DP0131	853026	220173	-105	0.146	12/1/2005
69DP0131	853026	220173	-115	0.168	12/1/2005
69DP0131	853026	220173	-125	0.193	12/1/2005
69DP0131	853026	220173	-135	0.168	12/1/2005
69DP0131	853026	220173	-145	0.019	12/1/2005
69DP0131	853026	220173	-155	0.023	12/2/2005
69DP0131	853026	220173	-165	0.003	12/2/2005
69DP0131	853026	220173	-175	0	12/2/2005
69DP1006	851894	220664	-42	0	5/13/2005
69DP1006	851894	220664	-52	0	5/13/2005
69DP1006	851894	220664	-62	0	5/13/2005
69DP1006	851894	220664	-72	0	5/13/2005
69DP1006	851894	220664	-82	0	5/13/2005
69DP1006	851894	220664	-92	0	5/13/2005
69DP1006	851894	220664	-102	0	5/13/2005
69DP1006	851894	220664	-112	0	5/13/2005
69DP2000	853722	221536	17	0	8/25/2005
69DP2002	853652	221464	17	0	8/25/2005
69DP2004	853625	221371	17	0	8/25/2005
69DP2006	853657	221277	17	0	8/25/2005
69DP2008	853673	221179	17	0	8/26/2005
69DP2011	853588	221065	17	0	8/26/2005
69DP2013	853540	220983	17	0	8/26/2005

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69DP2015	853565	220940	17	0	8/26/2005
69EW3001	853581	223473	15	0	9/24/2004
69EW3006	853582	223423	15	0	4/21/2004
69EW3030	853542	223422	15	0.98	9/24/2004
69EW3032	853531	223460	15	0.553	7/14/2004
69EW3046	853552	223402	15	0.826	7/15/2004
69EW3078	853563	223352	15	0	7/15/2004
69EW3081	853532	223351	15	0	7/15/2004
69EW3088	853595	223343	15	0	9/27/2004
69EW3154	853636	223274	15	0	9/27/2004
69EW3170	853596	223253	15	0	10/1/2004
69EW3180	853617	223224	15	0.16	4/1/2005
69EW3185	853656	223214	15	0	7/26/2004
69EW3201	853626	223176	15	0.391	4/1/2005
69EW3204	853656	223175	15	0	5/7/2004
69IG0001	853345	223750	40	0	4/27/2005
69IG0002	853637	223038	40	0	11/4/2005
69IG0012	853740	221962	-19	0	7/21/2005
69IG0013	853692	220906	-14	0	10/5/2005
69MW0012A	852340	222811	1	0	7/18/2005
69MW0012A	852340	222811	-9	0	7/18/2005
69MW0012A	852340	222811	-19	0	7/18/2005
69MW0012A	852340	222811	-29	0	7/18/2005
69MW0012A	852340	222811	-39	0	7/18/2005
69MW0012A	852340	222811	-49	0	7/18/2005
69MW0012A	852340	222811	-59	0	7/18/2005
69MW0012A	852340	222811	-69	0	7/18/2005
69MW0012A	852340	222811	-79	0	7/19/2005
69MW0012A	852340	222811	-89	0	7/19/2005
69MW0012A	852340	222811	-99	0	7/19/2005
69MW0012A	852340	222811	-109	0	7/20/2005
69MW0012A	852340	222811	-119	0	7/20/2005
69MW0012A	852340	222811	-129	0	7/20/2005
69MW0012A	852340	222811	-139	0	7/20/2005
69MW0012A	852340	222811	-179	0	7/21/2005
69MW0012A	852340	222811	-189	0	7/22/2005
69MW0012A	852340	222811	-199	0	7/22/2005
69MW0012A	852340	222811	-209	0	7/22/2005
69MW1261	855150	231595	-67	0	7/14/2005
69MW1264	854794	231657	-77	0	7/8/2005
69MW1267	855052	231201	-63	0	7/11/2005
69MW1271	854836	230541	-78	0	7/8/2005
69MW1272	854371	230454	-46	0.019	4/7/2005
69MW1274	855361	230680	-41	0	6/22/2005
69MW1275	853750	227823	-81	0.014	4/5/2005
69MW1278	853313	226256	-110	0.025	4/5/2005
69MW1279B	853279	226843	-61	0	1/17/2006
69MW1279C	853287	226842	-105	0.014	1/17/2006

**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69MW1283A	853301	225500	-137	0.996	3/29/2005
69MW1283B	853297	225494	-186	0.707	3/29/2005
69MW1284A	853243	224304	-180	2.32	9/9/2005
69MW1284B	853238	224309	-216	2.98	9/9/2005
69MW1285A	853482	223533	-34	0.016	9/9/2005
69MW1285B	853484	223537	-154	0.002	9/9/2005
69MW1288	853647	222952	-143	0	7/8/2004
69MW1291A	853552	223262	-84	0	9/12/2005
69MW1294	853542	223074	-18	0.006	9/12/2005
69MW1296A	853264	223257	-144	0	9/12/2005
69MW1297	853062	222436	-118	0	4/4/2005
69MW1298	853423	222092	-111	0	4/4/2005
69MW1300A	853273	222044	-1	0.162	9/13/2005
69MW1300B	853269	222043	-76	0.003	9/13/2005
69MW1301	853812	221510	-118	0	10/3/2005
69MW1302	853273	221809	-76	0	9/15/2005
69MW1303A	853292	224117	-174	0.007	9/13/2005
69MW1303B	853284	224123	-215	0.014	9/13/2005
69MW1304	853179	224480	-181	1.87	9/15/2005
69MW1305	854081	224160	-163	0	7/29/2004
69MW1306A	853148	221775	-82	0.507	9/15/2005
69MW1306C	853145	221772	-118	0.003	11/14/2005
69MW1308	853376	221765	-91	0	8/18/2005
69MW1311	852781	224307	-172	0	4/6/2005
69MW1312	853854	224590	-153	0	4/6/2005
69MW1313	854197	225810	-147	0	4/6/2005
69MW1315	852764	225364	-176	1.62	4/4/2005
69MW1317A	853494	223919	-142	0	9/13/2005
69MW1317B	853501	223931	-111	0	9/13/2005
69MW1317C	853499	223920	-60	0.009	8/16/2005
69MW1400A	853906	228652	-107	0.017	4/6/2005
69MW1401	854128	229230	-110	0.065	4/6/2005
69MW1403	854325	227788	-155	0.073	4/6/2005
69MW1404	852635	227893	-40	0	4/5/2005
69MW1411	855009	229668	-134	0.01	4/6/2005
69MW1416	853029	230528	-45	0.018	4/7/2005
69MW1419	854035	232297	-53	0.009	4/8/2005
69MW1501	852532	226177	-28	0	10/31/2005
69PWS40960	853060	226666	-18	0	2/15/2005
69PZ0004A	853641	217545	-5	0	10/4/2005
69PZ0004A	853641	217545	-15	0	10/4/2005
69PZ0004A	853641	217545	-25	0	10/4/2005
69PZ0004A	853641	217545	-35	0	10/4/2005
69PZ0004A	853641	217545	-45	0	10/4/2005
69PZ0004A	853641	217545	-55	0	10/4/2005
69PZ0004A	853641	217545	-65	0	10/4/2005
69PZ0004A	853641	217545	-75	0	10/4/2005
69PZ0004A	853641	217545	-85	0	10/5/2005



**Table D-1**  
**FS-28 2006 EDB Plume Shell Data Set**  
**Final FS-28 2005 Plume Update Technical Memorandum**

Sample Location	Surface Easting Coordinate (ft)	Surface Northing Coordinate (ft)	Sample Elevation (ft msl)	EDB Concentration (µg/L)	Sample Date
69PZ0004A	853641	217545	-95	0	10/5/2005
69PZ0004A	853641	217545	-105	0	10/5/2005
69PZ0004A	853641	217545	-115	0	10/5/2005
69PZ0004A	853641	217545	-125	0	10/5/2005
69PZ0004A	853641	217545	-135	0	10/6/2005
69PZ0004A	853641	217545	-145	0	10/6/2005
69PZ0004A	853641	217545	-155	0	10/6/2005
69PZ0004A	853641	217545	-165	0	10/6/2005
69PZ0004A	853641	217545	-175	0	10/6/2005
69PZ0004A	853641	217545	-185	0	10/7/2005
69PZ0004A	853641	217545	-195	0	10/7/2005
69PZ0004A	853641	217545	-205	0	10/7/2005
69PZ0004A	853641	217545	-215	0	10/7/2005
69PZ0004A	853641	217545	-225	0	10/7/2005
69PZ0004A	853641	217545	-235	0	10/10/2005
69PZ0004A	853641	217545	-250	0	10/10/2005
69PZ0004A	853641	217545	-255	0	10/10/2005
69PZ1291A	853552	223262	17	0	9/13/2004
69PZ1291B	853552	223262	-18	0.003	9/12/2005
69PZ1298A	853423	222092	9	0	8/18/2005
69PZ1298B	853423	222092	-31	0	8/19/2005
69PZ1300A	853273	222044	9	0.004	8/18/2005
69PZ1300B	853269	222043	-36	0	8/18/2005
69PZ1301A	853812	221510	12	0	8/19/2005
69PZ1301B	853812	221510	-48	0	10/3/2005
69PZ1302A	853273	221808	9	0.027	8/19/2005
69PZ1302B	853273	221808	-31	0	8/19/2005
69PZ1308A	853376	221764	15	0	8/18/2005
69PZ1308B	853376	221764	-45	0	8/18/2005
69PZ1309A	853512	221709	15	0	8/19/2005
69PZ1309B	853512	221709	-45	0	8/19/2005
69PZ1318	853276	222810	23	0	9/29/2004

Data Source: AFCEE, April 2006, MMR-AFCEE Data Warehouse.

Key:

ft = feet

msl = mean sea level

µg/L = micrograms per liter

**Table D-2**  
**FS-28 2006 EDB Plume Shell Statistics**  
**Final FS-28 2005 Plume Update Technical Memorandum**

	2006 Plume Shell				2003 Plume Shell			
	North of 69EW0001	Between 69EW0001 and SWP	Uncaptured	Total	North of 69EW0001	Between 69EW0001 and SWP	Uncaptured	Total
<b>Mass (lbs)</b>	4.99	0.008	0.419	5.41	5.36	0.044	0.513	5.91
<b>Volume (x10<sup>8</sup> ft<sup>3</sup>)</b>	2.40	0.006	0.186	2.60	2.18	0.021	0.053	2.25

Key:

ft<sup>3</sup> = cubic feet

lbs = pounds

SWP = shallow wellpoint